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Electricity and Water Pipes

Guarding against Damage

NO method of preventing metal from becoming accidentally charged with electricity is equal to earthing. Official recognition of the truth of this is to be found in the statutory regulations governing the supply of electricity and its use in factories and in mines, which specify voltages above which earthing is compulsory. By "earthing" is meant connecting the metal associated with an electrical installation with the general mass of the earth in such a way that at all times and in all weathers leakage current due to failure of insulation shall be immediately discharged. This entails a low resistance to earth—the I.E.E. Regulations specify one ohm at most.

The most obvious and the best method of obtaining this low resistance is by anchoring the earth-continuity system to the public water-supply mains, the virtue of which is that they run in the earth over a very wide area. Moreover, the water in them is not only a good conductor on account of the ordinary impurities contained in it, but also provides the closest surface contact for smoothing out irregularities in electrical resistance. The result is an almost ideal and—to the consumer of electricity—an inexpensive means of increasing security from shock or fire.

Possible Alternatives

But for the prevalence of metallic water pipes the consumer would be faced with the necessity—as he is at Melbourne, for instance, where in the renewal of the public water system mains of compressed asbestos are being substituted—of providing his individual earth electrode or relatively expensive earth-leakage switches.

Although the use of the public water mains for earthing has come to be regarded as an essential part of electrical practice, it may, nevertheless, give just cause of complaint to water-supply authorities if it causes damage to their property, or if workmen engaged on repairs to pipes receive electric shocks. Indeed, some water engineers are inclined to think that they have been unduly complaisant in allowing earthing so readily. The position is not made more easy on account of objections that have been based merely on conjecture. It was most appropriate, therefore, that Mr. H. W. Swann (Senior Electrical Inspector of Factories) should put the electrical case frankly to the Institution of Water Engineers as he did in his lecture last Friday.

How much of the damage that is admittedly electrical in its origin is traceable to electricity in its commercial form? The negative track returns of tramways have been blamed and often with reason; so have leaks from DC distribution networks, sometimes with equal reason. In this connection it is important to bear in mind that it is not heavy transient fault currents that cause trouble, but currents that persist, even if they reach only a few milliamperes. However, both tramways and DC distributors are becoming fewer; indeed, probably the worst offender—the old v.b. single-core cable system laid solid—has long been obsolete. It would therefore appear that grounds for complaint are disappearing rapidly, since the ill consequences of AC leakage are generally held to be negligible.

AC Leakage Effects

We are not so sure, however, whether this will prove to be the case. While electrolysis can undoubtedly be caused by the voltaic-cell effect produced by two dissimilar metals in acid or alkaline surroundings (and with this earthing has nothing to do) it is suspected that this may not account for all the corrosion (or erosion) that takes place.

The suggestion has been put forward that a small part of the AC leakage due to the inevitable percolation through the soundest insulation may, in certain conditions, be rectified by valve effect to unidirectional current. Even if this is so, it has yet to be proved that the very small and widely dispersed proportion of the aggregate current that is rectified really harms metal pipes, although, of course, its operations are continuous. This subject is well worthy of the attention it is receiving from the Electrical Research Association.

The regulations recently drawn up by a committee of the Institution of Civil Engineers, with the collaboration of the I.E.E. and the two leading associations representing the water suppliers, seem, in so far as they are based upon ascertained facts, to protect the interests of all parties. Should further research show the possibility of injury to water mains in ways not now appreciated, adequate remedies will no doubt be found.

Nevertheless, water engineers may legitimately claim that they give their consumers an uncovenanted benefit in providing an essential earthing system for their electrical installations and electrical engineers will reciprocate in seeing that they do not lose by it.

Standard Turbo-Alternators

WITH the aim of speeding up the manufacture and reducing the capital cost of generating plant the National Defence Committee of the United States has decided, according to *Reuter*, to establish standards for steam turbo-alternators. This procedure would no doubt influence the production of other plant such as boilers and auxiliaries, steam piping and valves. In Great Britain, at any rate, the advantage of standardisation on this scale would be more than offset by a slowing down of technical progress, since methods of steam raising and of steam expansion, steam conditions and voltage of generation, to name but a few items, are very far from becoming stabilised and depend partly on local conditions. Here the common standards are 30,000 and 50,000 kW. The former has been a natural standard; that is, it represented the greatest output for a machine running at the highest speed for the supply frequency, but as 40,000-kW sets for the same speed are being built for Ferrybridge, Y.E.P. and Sydney, new standards may be set up. The total capacity of generating plant in this country is expanding by about 600,000 kW per annum, requiring, say, fifteen new sets. Their manufacture can hardly be said to be a mass-production job that calls for rigid standardisation.

New Manager for Sydney

WHAT is probably the most important electrical job in Australia is being advertised. Mr. H. R. Forbes Mackay, who has for some years been the general manager of the Sydney Undertaking, is retiring from that position next year and the Sydney County Council is seeking a successor. Some details of the advertisement are given on another page. An esteemed correspondent in Australia, in drawing our attention to the matter, points to the short period allowed for applications. The advertisement appeared on December 3rd and the closing date is January 24th. He suspects the Council of a desire to restrict applications to engineers in the Antipodes and he thinks (and we certainly agree with him) that the position is of such importance as to warrant a much longer period. However, we give sufficient details to enable those who wish to make application to do so. The Empire Air Mail will then have an opportunity of justifying its existence by delivering the applications by the due date.

Compulsory Registration

PROTAGONISTS of compulsory registration in the electrical contracting industry seem to be pressing their claims more insistently of late. The most recent reference to the benefits of this long-asked-for reform was made by Mr. W. Riggs, president of the Electrical Contractors' Association, at a dinner at Newcastle-upon-Tyne. He claimed that compulsory registration of both contractors and operatives would do away with underpaid labour, and employés would know that they would be out of a job if their work did not reach a certain standard. Having roused a hornets' nest by its proposals for reorganising the supply industry the Government is likely to be somewhat apprehensive of embarking upon other electrical legislation, although we believe that there would be a large measure of support for such a step. Writing in THE ELECTRICAL REVIEW last June Mr. A. Kirk, a past chairman of the A.S.E.E., claimed that all reputable employers and workers in the installation business favoured compulsory registration. In last week's issue Mr. T. C. Gilbert, putting forward suggestions for rationalising and reducing the cost of domestic installations, said that with the removal of the half-trained dabbler from our midst (by registration) we should be able to rely more upon common sense and less upon regulations.

Electrifying Agriculture

THE recent crisis has accentuated the necessity of speeding up agricultural production. While the depression in farming is due to various factors it is now being widely realised that a change-over to electricity would become imperative in a state of emergency, when imported fuel would be at a premium. Germany and France have already made rapid strides in this direction and that British agriculturists are aware of the importance of the matter was shown by a report presented to the Council of Agriculture last week. While the report contained little that was really new, it made some useful suggestions, and it indicated that the agricultural people themselves are awakening to the advantages—or possibly the necessity—of electrical equipment. Particularly we would commend the assistance which is being given by certain Rural Community Councils, which, coupled with the four suggestions to electricity undertakings contained in Mr. W. Fletcher Cooper's article last week, should go a long way towards accelerating rural electrical development.

Loan Repayment

ONE of the reasons put forward by the London and Home Counties J.E.A. for its inability to balance its budget by the date stipulated by the Electricity Commissioners was that the Commissioners had declined to extend loan repayment periods. Particular reference was made to loans raised for the purchase of apparatus for hire and for meters. The Commissioners recently held a conference to discuss this matter. Evidence was submitted to prove that the useful "life" of vitreous enamelled cookers was at least ten years and that of meters at least twenty years. At present the repayment periods for these are seven and ten years respectively. According to the *I.M.E.A. Journal*, the Electricity Commissioners have promised to consider the extension of the periods. In the meantime the J.E.A.'s charges are going up, unless the further appeal decided upon last week by local authorities who are affected is successful. The threatened increase appears to have led to great gas activity in some parts of the area and to the displacement of electric cookers.

X-ray Progress

THOUGH the number of exhibitors was much the same as usual, considerably more equipment was on view at the Central Hall, Westminster, last week on the occasion of the twelfth annual congress of the British Institute of Radiology. Further progress has been made in the direction of compactness, due largely to the use of oil-immersed rectifying valves, and a notable advance has also been made in the simplification of control and the protection of the expensive X-ray tubes. The necessity of providing heavy mains for brief and intermittent heavy demands in diagnostic work has been obviated by the use of condenser discharge apparatus. New equipment of this kind is claimed to overcome disadvantages of earlier units. Another interesting development is a system of very close and localised X-ray treatment. Mr. Morgan Davies deals at length with these and other advances in his review of the exhibition in the following pages.

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Recent Radiological Progress.

By C. Morgan Davies, A.M.I.E.E.

New equipment seen at last week's exhibition

THE increasing importance of X-rays as an aid to medical diagnosis and treatment was clearly in evidence at this year's Radiological Exhibition, held at the Central Hall, Westminster, last week. In previous years one hall has sufficed to accommodate the exhibits but on this occasion two complete floors were occupied. The number of firms exhibiting remained practically as before, and the increase is accounted for by the greater range of apparatus displayed, the extended activities of one or two firms, and the greater amount of space necessary to demonstrate modern equipment to the best advantage. The majority of exhibits were concerned with diagnosis, this being the field which creates the greatest demand for varying types and quantity of equipment.

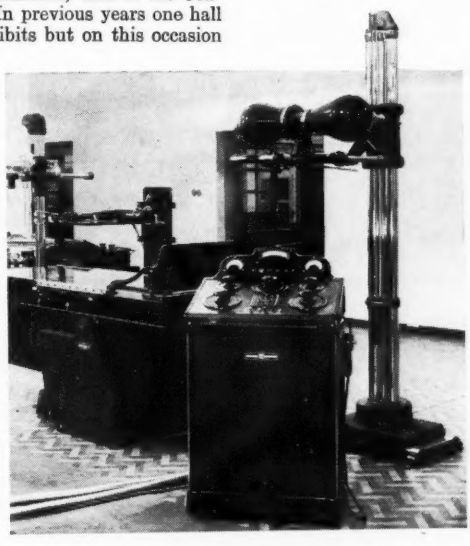
The range and types of diagnostic high-voltage outfits remain as before, with one important addition, the universal condenser unit, and the broad principles of design are in general unchanged. Four-valve sets having outputs varying from 400 to 600 mA at 80-100 kVp were shown on a number of stands, this type being eminently suited to ordinary all-round work and occupying an intermediate position in the price range. The increasing applications of oil-immersed rectifying valves have been an important contributory factor in the reduction of size, and the general standard of workmanship is of a commendably high order.

[Elec. Rev. photo.

The "Titanos" high-power equipment

During the last twelve months considerable progress has been made in the perfection and production of control gear for securing easy selection and accurate predetermination of the factors required in radiography, and for ensuring efficient excitation of the X-ray tube under conditions which will safeguard it from damage through overloading. In the course of diagnostic operations it is necessary to load the X-ray tube for different periods which may vary from a fraction of a second to several seconds in radiography, and for intermittent periods of many minutes in fluorescopy or screening. Serious damage or complete destruction of the tube may occur through many causes, such as application of excessive voltage, passing too great a current, exceeding the permissible time for a given energy input and incorrect sequence of operations. To provide adequate safeguards against all contingencies while still retaining useful ranges of factor selection involves a number of problems which have been solved in various degrees and ways by different manufacturers. The permissible loadings of the X-ray tube are given on a nomogram on which every combination refers to a definite rating in kW-seconds and the aim of automatic control is to permit of maximum freedom to vary the separate factors independently, at the same time ensuring that the permissible kW-seconds product cannot be exceeded. Any system which fulfils the latter requirement at the expense of lack of flexibility in independent factor selection falls short of the ideal and imposes limitations upon technique.

Technique is constantly being developed and it is necessary to ensure that the apparently unimportant limitations of to-day being serious hindrances to-morrow. The practical realisation of these ideals naturally increases the cost of apparatus, but the saving resulting from their omission is soon lost in practice. This is particularly the case when rotating anode tubes are installed and operators are left free to adjust the exposure factors from charts or, worse still, to indulge in the older practice of trial exposures or "tuning in." The internal complexity of control gear also increases, but when one considers the excellence of design and reliability of modern electrical equipment this need not provide any great concern to the user. The operative controls are in many cases simplified, comparatively speaking, and it should be remembered that the additional facilities now generally incorporated for the safe and rapid automatic operation of numerous examination accessory devices, provide a service considerably greater than hitherto. The influence of radio developments is apparent in the design of many components employed for control and protection. The utilisation of these helps towards standardisation, reduction of cost and ease of replacement.



[Elec. Rev. photo.

The Watson mobile control desk

The new "Rontgen 4" high-voltage generator displayed by Watson & Sons (Electro-Medical), Ltd., is a good example of the modern popular four-valve type. The apparatus may be arranged to operate one or more X-ray tubes, a new model motor-driven air break high-voltage selector switch being available for direct mounting on to the transformer assembly. The mobile control desk incorporates a compensator for mains voltage variations, a filament stabiliser, and automatically protected control gear which enables definite milliamperages, penetrations and exposure times to be obtained with safety. The mA selector furnishes four currents for each tube position and the interlocked synchronous exposure timer is of an entirely new type.

Newton & Wright, Ltd., exhibited a new model "Precision Tetravalve Unit" connected to a remotely controlled oil-immersed high-voltage selector switch and shockproof cable system. It incorporates a selector for simultaneous choice of tube, focus, pre-selected current, measuring instrument, and a register of maximum permissible tube loading. The "Neutronic" impulse exposure timer is actuated by gas relay valves, the grids of which are controlled by the discharge period of a condenser. The gas relays are connected directly in the operating coil circuit of the contactor.

[Elec. Rev. photo.

Victor tilting examination apparatus

The Solus Co. has solved the problem of automatic control by producing a mechanical nomogram with controls permitting of free selection of current and kV, time also being free up to the limit permissible for any given kW loading. The Dean four-valve apparatus has been greatly improved in detail, particularly with regard to exposure timing, and is now available with current pre-selector and automatic safeguards against overload. The indirect reading kV meters or indicators usually included on diagnostic control desks are now, in many cases, automatically compensated to read the actual kV across the X-ray tube under all conditions of loading. Among the smaller units may be mentioned the improved "D.3" Victor apparatus, exhibited in conjunction with simple tilting examination apparatus. This unit is of the type accommodating the X-ray tube and high-voltage transformer all in one tank, and is non-rectified. Its interesting feature is the use of a "Tungar" rectifier shunted by a resistance in series with the primary winding of the transformer, a system also employed in certain other units of Victor manufacture and useful for suppressing rise in voltage across the X-ray tube during the half cycle when no current flows.

Miniature Equipment

New additions to the range of miniature sets include the "Portex" apparatus exhibited in various forms by Mr. Cuthbert Andrews, and the "Little Giant" portable also shown on alternative mountings by Kohl's Scientific Instruments, Ltd. Some designers are favouring the construction of the high-voltage unit in two entirely separate sections. A good example of this form is the Westinghouse "Fluoradex D" apparatus shown on the stand of the Medical Supply Association, Ltd. The tanks housing the two high-voltage sections also accommodate the oil-immersed thermionic rectifiers and motor-driven high-voltage tube selector switches when required. The split or twin transformer design lends itself to a variety of layout arrangements, and the illustration shows the two transformers situated at either end of the rail mount on which the tube stand travels. This method of mounting makes for excellent mechanical construction, good electrical balance, and provides equalised shockproof cable suspension. Improvements in certain models of the Schall high-voltage units include the provision of an oil-immersed tube selector switch inside the transformer tank. The new Schall "X-ray Lantern," exhibited on a tube stand, has an output of 50 mA at 90 kVp. The mobile ward unit of the Solus Co. now incorporates oil-immersed valve rectification.

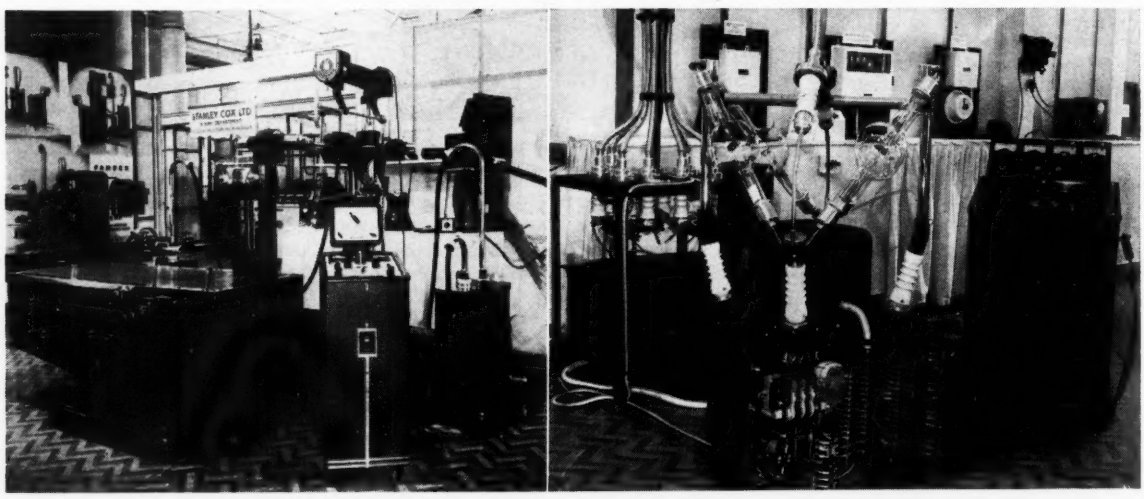
The "Titanos" apparatus manufactured by Koch & Sterzel which is exhibited for the first time in this country by Stanley Cox, Ltd., is representative of modern high power high-voltage equipment. The control system employed provides complete freedom in the selection of radiographic data, with full automatic protection from overloading the tube under all conditions of usage. It may be applied to six-valve or high-power four-valve circuits as desired, and the high-voltage unit and controls are all combined in one casing. Novel and useful features include the automatic stabilisation and control of the mA-seconds product by means of a special relay, which ensures the generation of the predetermined quantity of radiation irrespective of external disturbing influences; regulation of kV on the secondary side of the high-voltage transformer instead of on the primary as is orthodox, and the provision of a load selector calibrated to indicate percentage of the maximum permissible rating of the X-ray tube in circuit. The apparatus is suitable for serving any number of tubes up to a maximum of six. Philips Metalix also displayed a high-power four-valve set of compact one unit design and equipped with facilities for free or fully automatic operation.

New Condenser Diagnostic Unit

High-power diagnostic apparatus demands adequate power supply, together with heavy mains. These are only loaded to capacity intermittently for brief periods and, apart from the cost of their provision, are sometimes difficult, occasionally impossible, to obtain. Demands of this nature usually occur in connection with chest work, sometimes from sanatoria remote from major sources of electricity supply. The practical solution in these cases is the provision of condenser discharge apparatus; the principle involved being the charging of a suitable high-voltage condenser over a period of, perhaps, several seconds from a small source of supply, and then allowing it to discharge through the X-ray tube to provide an ultra-rapid exposure. While the principle is simple, its satisfactory execution presents numerous problems, particularly where a volume of work other than chest radiography is also involved. The condenser discharge units produced in the past have often been somewhat inflexible and limited in application.

Inspection of the control unit of the "Codiaphos" apparatus shown for the first time in this country on the stand of General Radiological, Ltd., indicated that the previous disadvantages associated with this type of apparatus have now been overcome. In addition to being suitable for screening and universal radiographic application, the apparatus has many revolutionary features of design. The controls provide for fully protected operation of any number of tubes up to four, the movement of two keys selecting the tube, focus, controls for free or standardised technique, and the accessory examination device required. Upon selection of a tube for free operation, a distinctively coloured load curve related thereto appears on the instrument panel, together with an illuminated guide pointer. It is then possible to choose any time/current combination for the selected mA-seconds setting, with free control of kilovoltage.

The load curve is displaced relative to the mA scale, according to the kilovoltage selected, and conditions should always be adjusted so that the illuminated pointer is within the boundary of this curve. Should, however, this not be the case, due to improper selection of the factors, and an overload be applied to the tube, a photo-electric cell housed in the shockproof shield will terminate the exposure when the anode temperature reaches 2,750 deg. C. Exposure control is by means of a three electrode high-voltage thermionic valve connected in series with the X-ray tube, the grid bias of the valve being governed by a high-frequency transmitter. The input circuit of the latter is operated by a special measuring system which ensures that the requisite mA-seconds will pass through the X-ray tube independent of its condition of temperature or the exciting kV. By this means and the elimination of mechanical contactors, extremely accurate short period exposures are obtainable, the minimum being 0.003 sec. All electrical factors on the apparatus are stabilised and the measurement of kV is direct. The controls are designed to operate the equipment as a straight condenser discharge circuit for exposures up to 300 mA-seconds and to constantly recharge the condenser for exposures of longer duration. The maximum instantaneous output is of the order of 2,000 mA with an initial kV of 100.

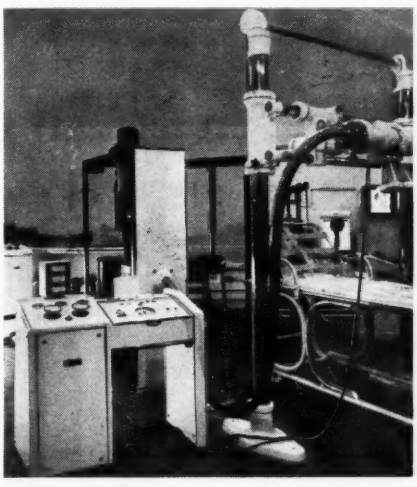


Left: Westinghouse "Fluoradex D" miniature equipment. Right: Precision tetravalve unit (Newton & Wright) *[Elec. Rev. photos.*

Many firms displayed examination apparatus, including Philips Metalix, which has recently extended its activities to this section of the X-ray industry. The motor-driven tilting couch is till in favour and most of the models inspected left little to be desired from the aspects of smooth, silent drive, ease of control, perfection of mechanical design and finish. A particularly good example of high-grade British production was on the stand of Watson & Sons, Ltd. The Bucky grid, a device utilised for eliminating fogging of the film by unwanted scattered radiation, has been much improved in detailed construction.

Most equipment of this class is now fitted with electrical release mechanism and arranged for synchronised exposure control. Spring and motor-driven wafer grids are also appearing on an increasing number of examination attachments.

There is a slowly growing tendency to bring the electrical controls for radiographic exposures, screening, and special room lights on to the examination equipment, a feature which greatly improves speed and ease of working, particularly in connection with stomach examinations. Attachments for the radiography of selected layers or sections, described as tomography, planigraphy, stratography, and by various other terms, are increasing in number. A new motor-driven device for this purpose was demonstrated on the stand of Schall & Son, Ltd., while F. R. Butt & Co., Ltd., exhibited a two-metre vertical stand designed for planigraphic application and normal usage. The most interesting exhibits connected with this new technique were seen on the stand of the Medical Supply Association, Ltd., and consisted of radiographs of horizontal sections of human subjects. These were shown, together with the experimental models constructed and used by Mr. W. Watson, F.S.R., in connection with his experimental researches on the production of this kind of section. Adjustable calibrated diaphragms for confining the beam of radiation to the desired limits in radiography are new introductions, those displayed by General Radiological, Ltd., and Stanley Cox, Ltd., being provided with movements operating over calibrated scales, thus avoiding the necessity for utilising a number of cones which need constant changing. The "Kymograph" developed by the Solus Co. has been much improved, and its range of utility extended. It is fitted with an electrical contact device for controlling the X-ray exposure.



[*Elec. Rev. photo.*
Philips "Maximus T" deep-therapy set

Deep and Superficial Therapy

The trend of design in deep-therapy equipment is towards increasing output and reduction in dimensions. The Westinghouse 25-mA, 200-kVp plant exhibited by the Medical Supply Association is a compact assembly of the twin high-voltage transformer design. The "Maximus T" equipment exhibited by Philips Metalix is an entirely new design employing the Villard pulsating voltage circuit in conjunction with a three-electrode air-insulated X-ray tube of small dimensions, continuously rated at 30 mA at 200 kVp. Here again the split transformer design is favoured, each half consisting of a high-voltage transformer, a condenser, and a valve. The anode of the X-ray tube is cooled by water pumped through concentric ducts in the shockproof cable, heat dissipation being by fan and radiator. A feature of the control desk is the built-in dosemeter, with dosage printer added, which gives an accurate record at the end of each treatment.

Another new introduction is the Siemens Röntgen bomb, exhibited by General Radiological, Ltd. It is continuously rated at 30 mA at 200 kVp and the transformer and X-ray tube are oil-immersed in one tank, the whole forming the "treatment head." Upon first inspection, the excellence of mechanical design attracts immediate attention. Considering the weight of the high-voltage assembly, the movements are remarkably free and easy, resulting from the replacement of the orthodox system of counterweights by a powerful compensated system of springs, an effort of only a few pounds being necessary to overcome the inertia of the weighty mass. Cooling of the X-ray tube is effected by forced-oil circulation, the oil being deprived of its heat in a water-cooler. All the deep-therapy sets shown were fitted with adequate instrument equipment, electrically controlled radiation shutters, and efficient controls and protective devices.

The Victor X-ray Corporation has added to its range of therapy apparatus a unit specially designed for medium and superficial application for treatments at between 60 and 140 kVp. The plant consists of a special oil-immersed Coolidge tube mounted on a suitable stand and excited by a twin-valve rectified high-voltage through shockproof cables, control being carried out from a neat, wall-mounted panel. Cooling of the X-ray tube is effected by water circulation through a coil fitted in the shockproof tube housing. Another new unit of this type was seen on the stand of Watson & Sons, and it is noted that twin-valve half-wave rectification is now displacing the so-called non-rectified or self-suppressing circuit for normal and medium superficial therapy.

Considerable interest is being taken in the comparatively new Chaoul therapy, also referred to by the terms contact and cavity therapy, X-ray caustic, and short- or near-distance low-voltage X-ray therapy. Medical reports on the subject indicate a high proportion of successful treatments, and users of the technique display great enthusiasm. The method consists essentially of the application of a dose of radiation, carefully localised to the diseased area, and applied from a special X-ray tube in such manner that the distance between the source of X-rays (tube focus) and lesion is comparatively short. The radiation is generated by anode currents of the order of 2-4 mA at 50-60 kV constant potential. The technique is only applied to diseased areas which are visible to the therapeutist, such as those normally superficial, accessible through cavities, or rendered visible by surgical operation. Apparatus for this purpose was exhibited on two stands.

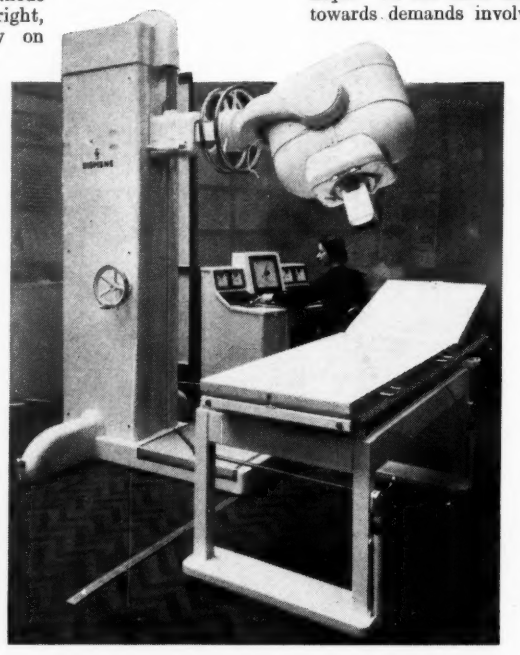
The Siemens "Monopan" unit shown by General Radiological, Ltd., employs a tube in which the anode operates at earth potential and is cooled by a stream of tap water. The Philips "Metalix" apparatus has a tube in which the cathode operates at earth potential and anode cooling is effected by forced air which flows through an annular space between the flexible shockproof cable and a tube surrounding it. In both equipments the high-voltage unit and controls are accommodated in a single casing, the Philips apparatus being completely mobile.

[*Elec. Rev. photo.*
"Codiaphos" condenser discharge unit (General Radiological)

Tubes, Valves and Accessories

The "Isolex" oil-immersed shockproof tube manufactured by Mr. Cuthbert Andrews is now available with double-focus inserts. A new oil-immersed tube designed for diagnostic application was exhibited by Radiologie, Ltd. This is named "Olea," and the shields are available in three sizes, according to maximum permissible kV, the smallest measuring approximately 12 in. long by 5 in. in diameter. The new universal "Safety Ray" tube of Kohl's Scientific Instruments, Ltd., is cooled by water circulating through a coil immersed in the oil-filled shield and arranged in two sections concentric to the insert. An improved model therapy tube for operating in conjunction with the 400-kV "Maximar" apparatus was exhibited by the Victor organisation. This is provided with a self-contained filter of 2 mm. Cu. and a target deep seated in a bored-out anode of the accelerating type. General Radiological, Ltd., displayed two new types of therapy tube for 30 mA operation at 200 kVp, also original designs having pointed and pencil-shaped anodes, intended for cavity therapy.

A number of small-dimensioned rectifying valves for oil immersion are appearing, and it was noted that the new high-voltage units of Watson & Sons were equipped with British-made valves of this type. Small power valves continue to find an increasing number of applications in the X-ray field. The new rotating anode delay device of Newton & Wright, Ltd., which operates entirely on thermionic principles, is an example of this. A moderately priced film viewer fitted with an 80-W high-pressure gas discharge lamp and mechanical dimming device was exhibited by Philips Metalix. This year, visitors were reminded of the importance of proper film-processing equipment by the exhibits on the stand of Kodak, Ltd. These included a stainless steel developing and fixing unit fitted with electrical heating and automatic temperature control. An electrically heated and ventilated film-drying cabinet was also displayed.



[*Elec. Rev.* photo.
Siemens Röntgen bomb (General Radiological)

High-frequency treatment, not being concerned with X-rays, is now segregated from radiology, at least in the large general hospitals. It is, however, closely allied so far as the manufacturers are concerned, and a number of generators for this form of treatment were shown. Marconi-Ekco exhibited a wide range of scientific instruments, among them the ultra-short wave treatment apparatus known as the "Theracoupler." This is primarily designed for application by the induction method, but may also be supplied with an attachment for applying treatment by the condenser-field method. The output circuit operates at a frequency of 15 megacycles and is rated at 40 gram-calories per second.

The main impressions emerging from this year's exhibition are that intense activity prevails, and that definite improvements in detailed construction, refinements of control, electrical efficiency and automatic protection are proceeding at a fair pace. At the same time there are no radical changes in principal components which are likely to render good installations of three or four years ago obsolete. Many of the detailed developments can be added to these, if desired, and the resultant benefits applied to improved and extended technique. At the same time the indications of the future point towards demands involving improved rating of X-ray tubes and greater outputs from high-voltage units. In the field of radiography the reasons for these increases are the desire to improve the quality and diagnostic value of the radiograph by further elimination of unwanted scattered radiation. This involves closer coning or restriction of the primary beam of X-radiation, and one also hears advanced workers discuss the possibilities of improved and even double Bucky grids. The grid is also being applied to chest work, particularly in the case of obese patients.

Coupled with these there are the speed limitations imposed by high-definition fine-grain intensifying screens and the newer technique involving the complete abolition of screens. All these tendencies make for higher power unless speed of exposure is sacrificed in an effort to avoid loss of definition consequent upon movement. This often cannot be done in cases in which involuntary movement of unseen organs occurs, with patients under anæsthesia, and where non-co-operation of the very ill, the nervous adult, or frightened child is experienced.

So far as future developments are concerned, it would be strange if radiology and the X-ray industry were without their quota of non-progressives and sceptics, and these may be reminded that almost every scientific advancement has been accompanied by the criticisms of those who underrate the achievements of the past, consider methods of the present perfect, and view further developments as unlikely to offer any further advantages. Considering the various difficulties which arise in this field of electrical science, the progress made since the discovery of X-radiation has been remarkable, and this year's show indicated that there is no slowing down.

Anglo-French Radio Link

AS a result of a year's operation of the ultra-short-wave radio link between Belfast and Stranraer, the British Post Office and French P.T.T. have placed a joint order for a system on similar lines but with improved performance to be installed across the English Channel. The equipments will be manufactured by Standard Telephones & Cables, Ltd., and Le Matériel Téléphonique, and will be designed for an ultimate capacity of eighteen circuits, although initially they will only be equipped for nine. They will be placed in unattended stations having optical visibility between them. Many precautions have been taken in the new equipments to ensure continuity of service. Although such items as the power plant are common to the whole of one terminal equipment, the eighteen circuits are split into two groups of nine circuits, in each of which the common transmitting radio-frequency amplifiers and the first stages of the receivers are duplicated, and special arrangements automatically switch in spare units in the event of failure of any common portion. The equipment is normally operated direct from AC mains, the necessary DC power being obtained from selenium rectifiers.

There is a standby 15-kW Diesel engine plant which starts up automatically and takes over the load within one minute of any failure of the mains supply. Each group of nine circuits will have its own transmitting and receiving directive aerial system. Each antenna, both transmitting and receiving, is designed to give a gain of approximately 18 db over a simple half-wave antenna. The antennæ are vertically polarised for transmission from England to France, and horizontally polarised in the opposite direction. The operating wavelengths in one direction will be 3.6 and 4.4 metres, and in the other 3.95 and 4.9 metres. The new equipments are of the latest design, and among other features include "weak talker" devices which ensure that the transmitters are kept fully modulated for low incoming speech levels. This device can give an improvement of 10 db in signal-to-noise ratio for a weak talker. The circuits are continued over land cable on a four-wire basis to the nearest repeater station, from which points the switching on and off is by remote-control.

Electro-deposition of Tin

FOR some years methods have been available for producing coatings of tin by electrodeposition from acid or alkaline baths. Recent publications of the International Tin Research and Development Council should help users to decide for themselves the respective merits of these baths for their own special purposes.

One of these, Booklet 82, explains how alkaline solutions have been investigated at the Council's laboratories and all the published methods examined, indicating that stannite baths have to be used with care owing to their liability to oxidise, but stannate solutions can be used over a wide range of concentrations and plating conditions, which latter affect the cathode efficiency of the process. Tin anodes are satisfactory if the current density is controlled so that an oxide film is formed and maintained over them in the way which is fully described in the report. The effects of addition agents and chlorides are considered and methods for the analytical control of the plating solutions are described.

In addition to this publication, Booklets A56 and 83 describe how acid solutions have been investigated with particular attention to the effects produced by the three addition agents which had previously been found to be all necessary. Different combinations of addition agents in baths of the same basic composition were worked for nearly six months, and the effects of several types of protective colloid were examined.

An appendix gives details of the preparation and control of that solution which consistently gives a good deposit over the longest period.

I.E.E. Summer Meeting

The Council of the Institution of Electrical Engineers has accepted an invitation from the Committee of the North-Western Centre for the summer meeting for 1939 to be held in Manchester and district from Monday, June 19th to Friday, June 23rd. The programme of social functions and visits to works will be announced later.

Measuring Small Cable Resistances

By A. Rosen, Ph.D., A.M.I.E.E.

Dr. Rosen is with Siemens Bros. & Co., Ltd.

In the following article methods of eliminating the effects of leads and junctions are described. Some are well known and are included for the sake of completeness, while others are less familiar and the author has been unable to find any previously published description of them.

IN the measurement of cables of low resistance the wires used for connecting the cable to the measuring circuit may have a resistance comparable to that of the cable. Allowance for these leads is therefore necessary and is generally a simple matter, although troublesome when a number of measurements have to be made. However, the contact resistance between cable and leads is not a known quantity, and when the cable has a very low resistance, the contact effect requires special means to deal with it. The following notes refer to methods which are employed in a cable factory.

The usual method of measuring a small *DC* resistance by a Wheatstone bridge is to take a reading with the unknown resistor connected to the bridge, and a second reading with the connecting leads short-circuited; the difference between the readings corrected by the appropriate factor for the ratio arms used gives the required value. When a large number of readings has to be made with the same leads it is convenient to have an auxiliary resistor in series with the known arm of the bridge. Then, with the lead wires short-circuited and the main resistor set to zero, the bridge is balanced by an adjustment of the auxiliary resistor; when the leads are connected to the cable the subsequent balance is made by adjusting the main arm, which gives the net reading.

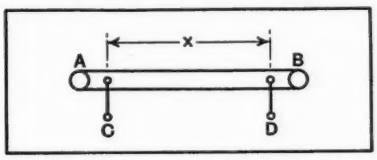


Fig. 1.—Four-terminal resistor

Kelvin Double Bridge

This method is inapplicable when the unknown resistance is so small that contact resistances become important. In these cases it is usual to employ a potentiometer arrangement, such as the Kelvin double bridge, the small resistance being first defined by making the unknown into a four-terminal resistor: fig. 1, *A* and *B* are the "current" terminals, *C* and *D* the "potential" terminals, the resistance x being the portion of the total that is intercepted between *C* and *D*.

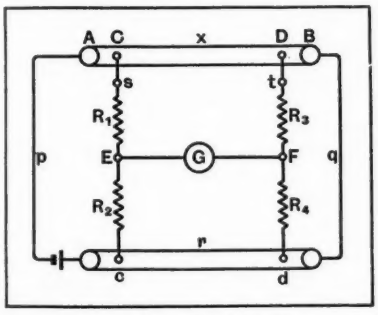


Fig. 2.—Kelvin double bridge

In the Kelvin double bridge a current (large compared with ordinary Wheatstone practice) is passed through the unknown in series with a standard variable four-terminal resistor, and the latter is adjusted until the potential differences across the unknown and the standard are equal, or are in a known ratio to each other. In fig. 2, r is the portion of the standard intercepted between the potential contacts c, d; R_1, R_2, R_3, R_4 are fixed resistors of relatively large value and $R_1=R_3$, $R_2=R_4$. $R_1/R_2=R_3/R_4=n$, where n may be a convenient power of 10. The leads connecting the unknown to the bridge are of small resistance compared with R_1 and R_3; the "current" leads are of resistance p, q, and the "potential" leads of resistance s, t, respectively. The resistance q comprehends the total resistance between the potential contacts *D* and *d*.

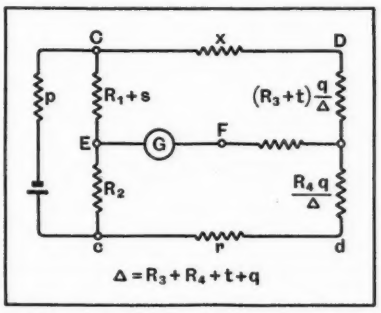


Fig. 3.—Equivalent circuit of Kelvin double bridge

The standard resistor is varied until the galvanometer *G* connected across *EF* shows no deflection. The condition for balance may be obtained in a simple manner by the use of the Kennelly star-mesh theorem.* The mesh *DF*, *Fd*, *dD* is transformed into its corresponding star; the resulting network is shown in fig. 3. At balance,

$$\frac{R_1+s}{R_2}=\left(x+\frac{(R_3+t)\,q}{\Delta}\right)\Big/\left(r+\frac{R_4\,q}{\Delta}\right) \quad \ldots\ldots\ldots\ldots\ldots (1)$$

where $\Delta=R_3+R_4+t+q$.

$$\text{Whence } x=nr\left(1+\frac{s}{R_1}\right)+\frac{q\,(s-t)}{\Delta} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

where $n=R_1/R_2=R_3/R_4$.

In practice, s/R_1 can be neglected compared with 1, and $\frac{q\,(s-t)}{\Delta}$ is small compared with x. Thus the condition for balance reduces to the simple equation

$$x=nr \quad \ldots\ldots\ldots\ldots\ldots (2a)$$

It is not generally appreciated that the ordinary Wheatstone bridge can be used for measuring four-terminal resistors by the following method. The unknown is connected as shown in fig. 4, and two readings are taken with the battery joined respectively to the inner terminals *C* and *D*, the ratio arms remaining unaltered. Let the first reading be R_a and the second R_b, and let $R_a-R_b=r$.

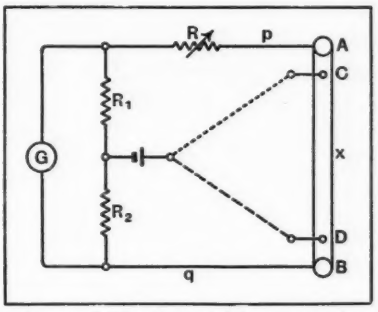


Fig. 4.—Wheatstone bridge measuring four-terminal resistor

$$\text{Then } \frac{R_1}{R_2}=n=\frac{R_a+p}{q+x}=\frac{R_b+p+x}{q}$$

$$\text{Whence } x=r/(n+1) \quad \ldots\ldots\ldots\ldots\ldots (3)$$

In an actual test, the ratio arms were 10,000 and 10 ohms respectively, and R was adjustable in steps of 0.1 ohm. Using a battery of six cells and a galvanometer having a sensitivity of 0.04 μA per scale division, it was possible to estimate R to 0.01 ohm, and thus the unknown could be measured to 10^{-3} ohm; normal contact resistances may be of the order 10^{-3} to 10^{-4} ohm, and bad contacts considerably higher.

The Kelvin bridge is capable of measuring small resistances to a higher accuracy than 10^{-3} ohm, and it has the advantage of giving the result directly, instead of as the difference between two larger readings. The Wheatstone bridge method may, however, be of service when a Kelvin bridge is not readily available.

Fault Location

The location of a fault in a low-resistance conductor due to a contact with another conductor or with the lead sheath is best performed by a modification of the Murray loop test. The ends of the cable are provided with "current" and "potential" terminations, and the connections are made as in fig. 5. The ratio arms R_1 R_2 are preferably formed of a high resistance potentiometer, such that

*A. E. Kennelly; "The Equivalence of Triangles and Three-pointed Stars in Conducting Networks," *Electrical World*, 1899, Vol. 34, p. 413

the resistances of the potential leads *s t* are negligibly small in comparison; alternatively, one of the fixed ratio arms and the variable arm of a Wheatstone bridge may be used. The

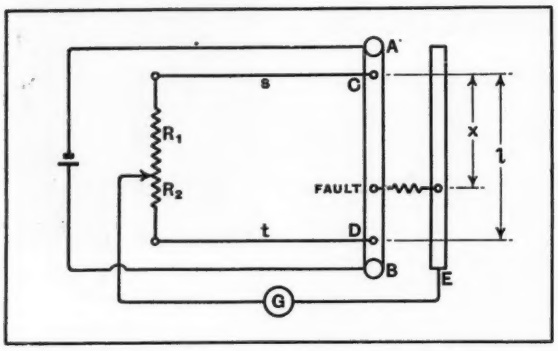


Fig. 5.—Murray loop test for low-resistance conductors

position of the fault is given by the following calculation:—

$$\frac{x}{l}=\frac{R_1+s}{R_1+R_2+s+t} \quad \text{..... (4)}$$

$$\simeq \frac{R_1}{R_1+R_2} \quad \text{..... (4a)}$$

If a potentiometer of 10,000 ohms resistance is used, then

$$\frac{x}{l}\simeq\frac{R_1}{10{,}000} \quad \text{..... (4b)}$$

This test is similar to the Kelvin double-bridge test, in that the requisite accuracy can be obtained by passing a large current through the cable. On the other hand, when the fault is to earth in a laid cable, earth currents may flow in the galvanometer circuit and off-set the high sensitivity; in these circumstances, it may be desirable to interchange the battery and galvanometer.

The Varley loop test in its usual form is more suitable for faults in cables of high resistance; however, by an extension of the method illustrated in fig. 4, it becomes adaptable to both low- and high-resistance cables. The cable ends are provided with double terminals as for the low-resistance Murray test, the scheme of connections being illustrated in fig. 6. Readings are taken with the battery connected respectively to the inner terminals *C*, *D* and earth. If the corresponding readings are R_c, R_d and R_e then

$$\frac{R_1}{R_2}=n=\frac{R_c+p}{l+q} \quad \text{..... (5)}$$

$$=\frac{R_d+p+l}{q} \quad \text{..... (6)}$$

$$=\frac{R_e+p+x}{q+l-x} \quad \text{..... (7)}$$

Whence $l=(R_c-R_d)/(n+1)$ ..... (8)

$x=(R_c-R_e)/(n+1)$ ..... (9);

$x/l=(R_c-R_e)/(R_c-R_d)$ ..... (10)

This method necessitates three readings as compared with one for the Murray loop test, and is therefore not so suitable for cables of very low resistance. On the other hand, the resistance of the conductor obtained from equation (8) is a useful check on the accuracy of the readings; the galvanometer is not affected by earth currents; and there is less disturbance of the normal Wheatstone bridge connections. This use of the Varley loop test is suitable for laid cables, provided that the necessary two good wires are available for connection to the distant end, and it is of value when there is no good return conductor of the same gauge as the faulty one, as the resistance of the return conductor does not appear in the equation for the position of the fault.

Resistance Unbalance

The two wires of a pair in a telephone circuit should have approximately equal resistance, and in good quality cables it is generally specified that, in every manufacturing length, the difference of resistance should not exceed 1 per cent. of the loop value. Measurements of resistance unbalance are made regularly in the factory, and it is desirable to be able to read to 1 per cent. of the specified maximum, *i.e.*, to 0.01 per cent. of the loop resistance. A cable having conductors weighing 40 lb. per mile, which is the largest size now in regular use, has a loop resistance per 100 yards of 2.5 ohms, and it is necessary to detect an unbalance of 0.00025 ohm. Thus the elimination of contact resistances is very important if consistent readings are to be obtained. On the other hand, as a large number of pairs have to be tested, it is desirable to have a rapid method of making connections to the cable ends, preferably by means of spring clips. An arrangement which satisfies both requirements and also eliminates the resistance of the lead wires is described below.

Considering first the simplified circuit shown in fig. 7 (1), the two wires of the pair are of resistance *a*, *b* respectively, and the balance is obtained by varying the position of the slider of a potentiometer of total resistance *R*. If at balance the potentiometer arms are of resistance $\frac{1}{2}(R+r)$ and $\frac{1}{2}(R-r)$ respectively, then the pair unbalance is given by

$$\frac{a+b}{a-b}=\frac{100r}{R} \text{ per cent.} \quad \text{..... (11)}$$

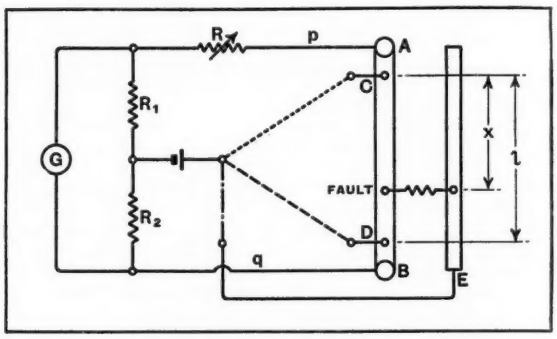


Fig. 6.—Varley loop test for low-resistance conductors

In this simple circuit any lead wires would be in series with the cable, and even when they are unbalanced, their resistance would introduce a troublesome correction term if comparable to the loop resistance of the pair under test.

Referring now to fig. 7 (2), it will be seen that the leads to the cable are duplicated, one pair being used for the galvanometer, and the other to extend the ratio arms. Further, the spring contacts which make connections to the cable are also duplicated. The resistances due to one pair of leads and contacts are thrown into the galvanometer arm, where they do not affect the bridge balance; those due to the other pair of leads and contacts are placed in series with the ratio arms, and by making the latter of sufficiently high resistance, the effect is so much diminished as to be negligible. For example, a contact resistance of 0.1 ohm would cause an apparent unbalance of 4 per cent. on a loop of 2.5 ohms, if in series with the cable, *i.e.*, four times the permissible maximum, whereas the same contact resistance if in series with a 10,000-

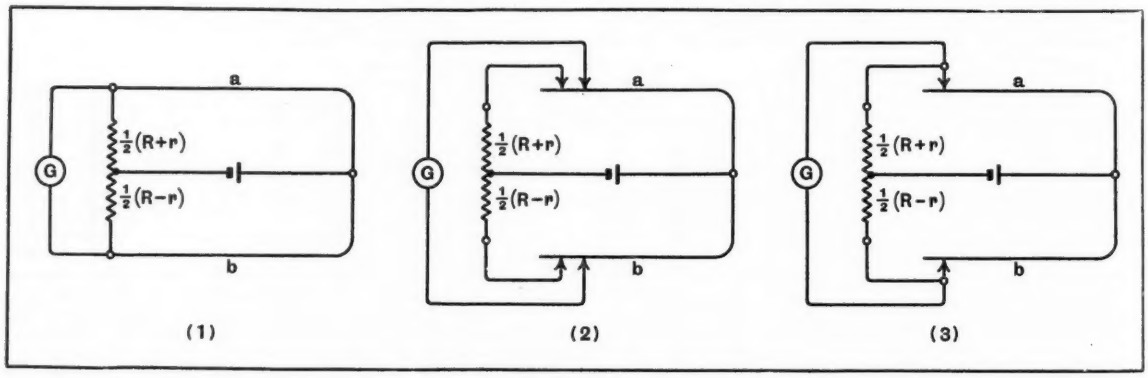


Fig. 7.—Measurement of resistance unbalance

The Polygon Tariff.

By D. J. Bolton, M.Sc., M.I.E.E.

A World Power Conference topic

A GLANCE at the titles and summaries of the recent World Power Conference papers reveals a number of references to the polygon tariff and many readers in this country will have wondered, not without trepidation, what is meant by this unfamiliar title. One thought that we already suffered from every conceivable variety of tariff. Is it possible that there is still another to be added to the list, and are we shortly to be invaded by some Continental varieties? On further examination, however, our anxiety is relieved. The polygon tariff proves to be merely a new name for a very old device—probably the oldest of all selling devices, that of "reductions for quantity."

Principle Explained

The name "polygon" suggests a graphical description, and can only be understood by referring to a figure. But instead of plotting the energy price per unit to some convenient base or other, it is necessary to plot the *total* bill (or revenue from consumer) to this same base.

Consider, for example, a block rate tariff in which the first n_1 units per annum are sold at p_1 pence per unit, the next n_2 units per annum at p_2, and all subsequent units at p_3. If n is the annual consumption of any particular consumer, then when n is small (less than n_1) the total bill will be np_1, and will be proportional to n. That is to say, a graph of annual bill plotted against annual consumption will be a straight line passing through the origin (fig. 1).

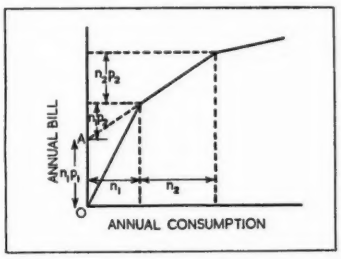


Fig. 1.—Total bill, block rate tariff

If, now, the consumption is greater than n_1, but less than n_1+n_2, some of it will be purchased at the cheaper rate, and the total bill will be $n_1p_1+(n-n_1)p_2$ or $(n_1p_1-n_1p_2)+np_2$. Since the terms in the bracket are constant (represented by the distance OA) and the last term is a linear function of n, it follows that this part of the graph will be a straight line not passing through the origin. By the same reasoning, for consumptions greater than n_1+n_2 the graph of the total bill will follow another straight line with a still smaller slope. This last line will cover all subsequent consumptions, and if continued back it would cut the Y axis at a height of $n_1(p_1-p)+n_2(p_2-p)+np$. It follows that in any block-rate tariff, whatever the number of blocks, the total account can be represented by a rectilinear figure or polygon. The number of vertical slices composing the polygon will equal the number of blocks in the tariff, counting the final follow-on rate as one block.

Consider next a two-part tariff consisting of an annual fixed charge and a flat rate per unit. It is immaterial for the present purpose whether it is an industrial or commercial tariff with a fixed charge based on kilowatts or an all-in domestic tariff with a fixed charge dependent on house size. For any one consumer and at any one time, the total bill will necessarily be represented by a triangle standing on a rectangle—*i.e.*, by a polygon (fig. 2). If the unit rate is stepped the top line will bend over, as indicated by the chain-dotted line on the figure. If the base is scaled in kWh per kW or per unit of house size, the same graph will serve not only for the individual case but for any consumer.

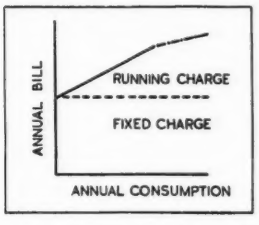


Fig. 2.—Total bill, two-part tariff

Merits and Disadvantages

The polygon tariff then is not a special type but a special way of illustrating the most general type of all. Let us consider what are the merits, and what the demerits, of this particular method of representation. One point in its favour is that it is easy to draw since it consists only of straight lines, and this is a great help when one desires to compare the operations of several different tariffs. It shows the total amount spent on electricity by a consumer, and is a guide to (or can be compared with) the total service rendered. When the graph starts above the origin, or slopes more steeply at the commencement, this corresponds to the service value of having electricity "on tap" or the higher utility value of the earlier units.

The disadvantage of this method of presentation is that it does not tell what the consumer is most anxious to know, namely, his average or overall price per unit. It is all very well for the expert to "rationalise" the tariff and to explain the fixed charge in terms of initial service value and so on. Unfortunately, most people are not rational (as the world is learning to its cost) and the first question and criterion which the average consumer puts is—what am I paying per unit, and could I pay less on any alternative tariff or scheme? A graph which plots price per unit, no matter what its base scale, will therefore be preferred by most people and for most purposes. Fortunately, as will be seen later, this is not entirely incompatible with a rectilinear figure.

An Actual Case

The graphs so far drawn have been scaled in algebraic symbols so as to show general principles. In order to clinch the matter, however, it is well to take a specific tariff and give an answer in actual pence. A good example for this purpose is the Leigh undertaking which offers a simple form of block rate tariff for industrial power, and an all-in domestic tariff based on rateable value. The details of the block rate tariff are as follows:—

2d. per kWh for the first 1,000 kWh per annum.
1½d. per kWh for the next 1,000 kWh per annum.
1d. per kWh for all subsequent consumption.

Fig. 3 (chain-dotted line and bottom scale) shows this tariff as a mean price per unit to a base scaled uniformly in annual consumption. It commences with a horizontal line and then falls in a series of cascades (two in this case) which are really hyperbolæ on different base lines. This graph gives the information desired, but it suffers from two defects—it is troublesome to draw, and it gives insufficient weight to the earlier portions.

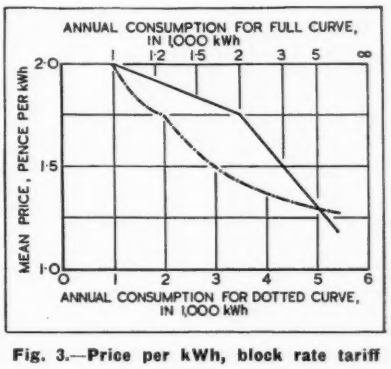


Fig. 3.—Price per kWh, block rate tariff

Both these defects can be remedied by plotting the required values to a different sort of base. If the base scale is made an inverse or reciprocal one, and taken from the right-hand end, the result will be a rectilinear figure or polygon. The top of Fig. 3 shows a scale of this sort, in which the distances from the right-hand end are the reciprocals of the figures shown thereon. The full-line graph shows the same

Measuring Small Cable Resistances (*Continued from previous page*)

ohm potentiometer would cause an error of only 0.001 per cent. The circuit shown in fig. 7 (3), which uses a double lead with single contacts, eliminates the lead resistances, but leaves the contact resistances still in series with the cable, and is therefore liable to error unless the connections to the cable are very securely made.

Telephone cables are generally built up of two-pair units, termed quads, and for testing purposes the four wires of each quad are conveniently bunched together at the end of the cable remote from the testing end; the second pair may thus be used as the return lead for the battery circuit. A switch can be employed for interchanging the pairs to permit both to be tested with one clipping operation; this switch, being in the galvanometer and potentiometer circuits, can have relatively light springs, as here also contact resistance effects are unimportant.

It will be seen that the elimination of the undesired resistances is accomplished by two familiar devices, (a) by putting them in the battery or galvanometer arms, where they do not affect the balance, or (b) by putting them in series with high resistance arms, in comparison with which they are negligibly small. The circuit for measuring resistance unbalance provides an interesting example of the use of both methods.

The author is indebted to the management of Siemens Brothers and Co., Ltd., Woolwich, for permission to publish information contained in this article.

tariff as before but plotted to this inverse base scale. The price starts at 2d. and slopes down in two straight lines, the second of which would reach 1d. at a consumption of infinity.

The two graphs in fig. 3 showing the price per unit may then be compared with the graph in fig. 1 showing the total bill. The former is scaled in algebraic symbols, and the proportions are different from those of the above tariff but the number of blocks is the same.

The final illustration (No. 4) shows the domestic tariff of the same undertaking. The figures of this tariff are 12½ per cent. of the rateable value plus ½d. per kWh, and the graph shows overall price per kWh plotted against annual consumption per £1 of R.V. The chain-dotted line has a uniform base scale as shown below, and consists of a rectangular hyperbola. The same tariff plotted to an inverse base scale is shown by the full line and upper base scale. It consists of a single falling line which will be deflected downwards if the running charge is stepped. In any case, it will be a polygon of straight lines only. Once again, the results may be compared with the graph showing total bill. Fig. 2, although scaled in symbols, is drawn to the correct proportions for the Leigh tariff shown in fig. 4.

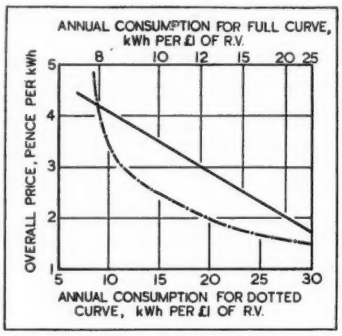


Fig. 4.—Price per kWh, two-part tariff

Fixed or Variable Blocks

In looking through the World Power Conference summaries one is struck by the many references to tariffs as the key to electrical development. Throughout the world two main types seem to predominate, namely, the block rate and the two-part or base rate. Neither appears likely to displace the other completely, although in the domestic field the tendency seems towards the two-part. The chief exception here is America, where the block-rate tariff is growing in popularity.

A curious divergence of viewpoint arises in this connection. In Great Britain, and apparently on the Continent, when block rates are used for domestic tariffs, the sizes of the blocks vary with the consumer's house size or value. For example in Sweden, where the polygon rate terminology seems to have originated, each consumer is assessed at so many "rate units" (R.U.)—usually about 200 square feet of floor area. (For simplicity some undertakings take each furnished and lighted room as one R.U.) A typical tariff would be to charge the first 30 kWh per R.U. at 4d., the next 70 kWh per R.U. at 1d., and all subsequent consumption at ½d.

The two-part all-in tariff could be put in this form with very little change in its effect. In the case of the Leigh tariff quoted above, if the first 10 kWh per £1 of rateable value were charged at 4d. per kWh and the remainder at ½d., the total revenue would be almost identical with what it is at present. The effect of this type of block rate is to give similar results to those of a two-part tariff except that very small consumers do not pay their full share of the fixed charge. For all other consumers, the fixed charge is in effect spread over the first block of high-priced units, and I have used the term "disguised two-part" for such block-rate tariffs.

The central feature of either of the above forms of tariff is that it has a definite correspondence with the utility value of the electricity. For any given size of house there is a certain minimum of lighting, radio and essential services, and the electricity for this has a very high exchange value, whereas additional consumption must be priced much lower in order to be competitive. American experience appears to be quite contrary to ours in this respect. Thus the T.V.A. employs a domestic tariff of the block-rate type in which the block sizes are fixed irrespective of the size of house. A large establishment could therefore buy some of its essential lighting at the cheap price, while a small householder could hardly hope to reach the low rate even for his heating energy. The argument in its favour is that it avoids any appearance of discrimination between consumers.

New Books

Fundamentals of Electricity and Magnetism. By L. B. LOEB. (Pp. 554; figs. 2247). London: Chapman & Hall. Price 20s.

THIS is a textbook in the best traditional style—clear, comprehensive, and without bias in the direction of the author's individual interests. Its scope is such that it would serve very well for use in connection with a pass B.Sc. degree course in physics, and it contains most of what a student of electrical engineering should know of the scientific basis of electricity and magnetism before commencing advanced electrotechnics.

After an introductory historical chapter of much interest, the course starts with magnetism, and proceeds from this directly to the electric current, Kirchhoff's laws and their application receiving special attention in the development of current theory. Sections on electrical measuring instruments, liquid conductors and thermo-electricity follow, and only after these have been disposed of is static electricity considered in detail. There is little doubt that in dealing with students who have an interest in the practical side of electricity this sequence is a sound one, since it does not start with a branch, electrostatics, which is relatively sterile in application.

From this one goes on to electro-magnetics and its various ramifications, including magnetic materials and the magnetic circuit, machines, induction, and transient and periodic phenomena. These are followed by an excellent section on waves and dimensions, and straightforward accounts of electricity in gases, atomic structure, photo-electricity and thermionics. The book concludes with sixty pages of problems, an author index and a subject index. The diagrams are plentiful, the illustrations of principles are taken from a wide range of classical and recent experiments and devices, and on all counts the book may be cordially recommended.—K. G. E.

Tables of Functions. By DR. E. JAHNKE and F. EMDE. Third edition. (Pp. 303; figs. 181.) Leipzig: B. G. Teubner. Price, Rm. 11.225.

The first edition of this book appeared in 1909 and was the first attempt to bring together tables of a number of higher mathematical functions. Until that time only isolated tables of this or that function had been published. Since the war we have had the comprehensive work from the United States, which is directed by Harold T. Davis, and the even more monumental undertaking of the British Association. But these publications run into many volumes while the book under review, which collects all the most essential figures for ordinary purposes between two covers, remains unique.

The book is divided into eleven sections, the greatest of which, devoted to Bessel functions, occupies nearly half the total space. The many uses to which these functions are put in modern engineering justifies the prominence which they receive. Among other functions tabulated are the error integral, elliptical functions and integrals, Riemann and Legendre functions. More elementary matter such as the hyperbolic functions which were included in the second edition are now omitted. The tables are largely based on those of the British Association and a generous acknowledgement to this body appeared in the second edition but has been omitted from the third.

The authors have shown much skill and judgment in condensing so much into one volume. The interval in the tables is necessarily large, but in work demanding the higher functions a close interval is rarely of practical importance. In this respect as in many others, serviceableness has been put before pedantic thoroughness. Just enough formulæ are given to ensure proper use of the tables, and, in order to economise space, curves are often substituted for tables. As the variables are mostly complex, two-dimensional curves could not represent the functions so the curves are shown as projections of charts modelled in three dimensions. These charts are of great value in representing the complete nature of the functions. The text appears in English as well as in German.

We regret that the excellent preface to the second edition has been omitted from the third. This preface was an integral part of the book and contained helpful advice as to its proper use.—R. O. K.

Shorter Notices

The 1939 edition of the "Practical Electrician's Pocket Book" has just been published by Odham's Press at 2s. 6d. There are new chapters on mechanical ventilation and refrigeration, and new matter is included on radio interference suppression, agriculture and the control of lighting circuits. Further additions have been made to the table of supply voltages, which now indicates the systems in 8,000 places in Great Britain.

"Air Conditioning," by J. A. Moyer and R. U. Fittz. 2nd edition. (Pp. 455; figs. 202.) Price: 25s. "Problems in Public Utility Economics and Management," by C. O. Ruggles. 2nd edition. (Pp. 772.) Price: 36s. London: McGraw Hill Publishing Co., Ltd.

"Alternating Current Bridge Methods," by B. Hague. 4th edition. (Pp. 587; figs. 193.) Price: 25s. "The Radio and Telecommunications Engineer's Design Manual," by R. E. Blakey. (Pp. 142; figs. 84.) Price: 15s. London: Sir Isaac Pitman & Sons, Ltd. "Electrical Installations," by J. W. Sims. (Pp. 190; figs. 110.) London: J. Murray. Price: 6s.

"Spontaneous Fluctuations of Voltage," by E. B. Moullin. (Pp. 251; figs. 88.) Oxford: Clarendon Press. Price: 17s. 6d.

An Up-to-date Cheese Factory

Extensive use of electricity

A TOTAL connected load of about 800 kW with a maximum demand of 300 kVA; no fewer than 180 electric motors of sizes ranging from ¼ to 100 HP and representing a total of 890 HP; a most elaborate system of refrigerated store rooms; a new type of factory lighting, and a novel arrangement of electric service conduits beneath the ceiling to give a clean layout and facilitate alterations to the layout. These are some of the interesting features of the electrical installation at the Kraft factory at Hayes, Middlesex, where ready-made cheese, some from the company's dairies in the West of England and the Midlands, and other purchased, is blended to a standard consistency and quality. Also, in the case of the "Velveeta" brand a further attribute is added, namely, its ability to spread easily.

The whole of one four-storey building comprising four rooms of 6,600 sq. ft. and another building with six of 3,700 sq. ft. are used as store rooms for the 3,000 to 4,000 tons of bulk cheeses, weighing 80 to 90 lb. each, which are always kept in stock. These rooms are kept at a temperature of about 40 deg. F. by means of automatically controlled refrigeration plant comprising three York Shipley ammonia compressors each driven by 20-HP, 1,500-RPM Brook motors with Igranic starters. A 250-A main switch control (G.E.C.) is provided with high rupturing capacity fuses, a sub-main fuseboard being fitted with English Electric h.r.c. fuses. A motor-generator supplies DC for operating special office equipment.

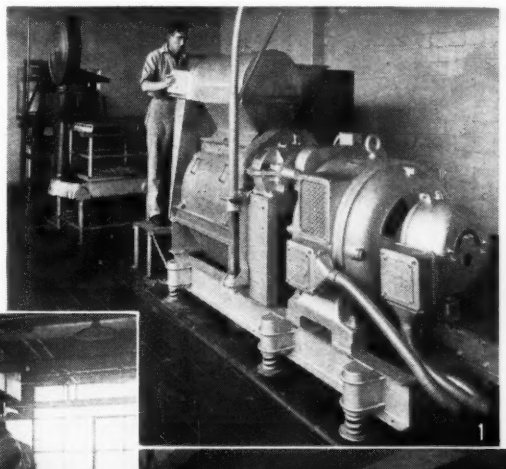
The bulk cheese is conveyed to the fifth floor of the main factory by means of a Waygood-Otis lift and placed in a large room where the temperature is maintained at about 40 deg. F. by means of two-pole thermostats regulating, in conjunction with solenoid-actuated valves, three Carrier air conditioners and their associated compressor equipment. Leading from this room is a special compartment cooled to about 16 deg. F. for storing egg yolks, butter, &c. York Shipley ammonia compressors for both these plants are situated in an adjoining room. They are controlled by Watford starters and are entirely automatic. The large one used in conjunction with the air conditioners is driven by a 40-HP, 1,500-RPM Brook motor, the smaller unit being provided with a similar 10-HP motor. The air conditioners are equipped with G.E.C. starters. Incidentally, "Osglim" lights in circuit with the interior lighting have been placed outside the cooling rooms to show whether the lighting is on or off.

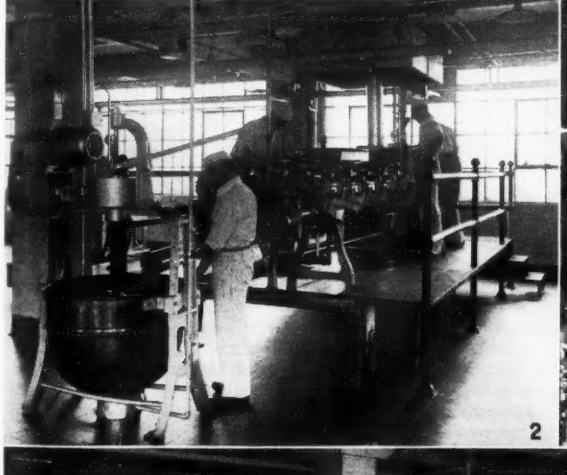
On the next floor the cheeses are divided into batches for blending, a roller conveyor bringing them to a dipping tank to loosen the bandages. For hoisting them in and out of the tank a 2-HP Normand geared motor operated by two G.E.C. starters with phase reversers and hand switches are used. From the dipping tank a short conveyor driven by a similar ½-HP geared motor carries the cheeses along the room a few feet for men to strip the bandages and also scrape off all rind. A constantly revolving worm wheel collects all the rinds and takes them to a receptacle on the floor below.

In the adjoining grinding room weighing is the first operation, the cheeses then being cut in batches by a guillotine and placed in large trucks. From these the pieces are fed, together with various ingredients (butter, milk, minerals, &c.) into grinding machines. The main motors (Crompton Parkinson) for each of these machines are rated at 100 HP, 1,400 RPM, a separate 3-HP geared unit being required for operating the feed rolls.

For comparatively small quantities of certain types of cheese there is a Saxonia grinder which embodies a 12½-HP, 930-RPM motor and works on much the same principle as a sausage machine. The third type of machine employed in conjunction with other kinds of cheese has granite rollers which press the cheese into flakes. This machine is driven through a shaft in the wall from a 15-HP, 846-RPM motor. One other machine, driven by a 7½-HP, 946-RPM motor, mixes various concentrates required in a special room set aside for the purpose. Close to this is another mixing room for the preparation of salad cream. Here the various ingredients are given a preliminary whisking by Hobart machines before passing on to special machines of the company's own design for heating and further mixing. The final mixture is gravity fed to the floor below for further treatment. Also on the fourth floor is a machine for making grated cheese. A hammer mill (5-HP) further reduces the cheese to powder. This is then dried and sifted by a Rotex sifter. Nearby is a small refrigerated room for general storage.

On the third floor one end is reserved for the various mixers, homogenisers, salad kettles, pumps, &c., required for completing production of salad creams and "Miracle Whip." Most of the re-



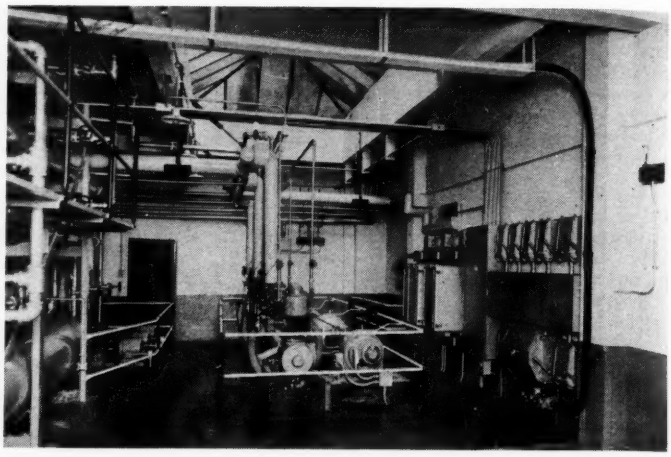


1. A 100-HP C.P. motor drives this grinding machine. 2. Rotary cooker with steam-jacketed storage kettle. 3. Rotary wrapping machine. 4. Wrapping room, showing special dispersive lighting from top of pillars *[Elec. Rev. photos.*

mainder of this floor is used as a cheese cooking room. The cheese from the grinders is gravity fed into long rotary steam cookers, worm wheels driven by 5-HP geared motors keeping the cheese in motion during the cooking process.

The cheese is run out of the cookers into large jacketed kettles. Paddles keep it in motion until it is required and then it is pumped *via* swivelling stainless pipes to wrapping machines on the floor below. Each of the pumps is driven by a 5-HP, 940-RPM motor. A special cream cheese called "Avalon" is packed by a Kustner machine.

Wrapping, labelling and boxing of the cheese occupies the main portion of the second floor. Conveyors with ½-HP geared motors extend the whole width of the room, bringing in the empty boxes and returning them full. There are about thirty wrapping machines driven by 1½-HP, 946-RPM motors. The flow of the liquid cheese into these machines is regulated by remote push-button control to the pumps upstairs, there being incidentally a system of light signals for co-ordinating the work of the grinding and cooking departments.



Compressor room for the cold storage building
[Elec. Rev. photo.

The filled boxes pass through holes in a side wall into the packing department and a further conveyor 2½ ft. in width (1½-HP geared motor) carries the completed packets along for dispatch in large cardboard cartons. The method of wrapping and packing described above refers to portions packed in circular boxes, but ¼-lb. and 5-lb. packets are dealt with in much the same way. An electrically operated box nailing machine (Morgan) nails up the wooden boxes of 5-lb. packets, a canning machine (E. W. Bliss) being employed for products for export. All wooden boxes for the 5-lb. packets are made by an electrically operated machine on the first floor. It is here, too, that the 2½ ft. wide conveyor brings the filled cartons and packing cases. Sorted on trucks, these are placed in two cooling rooms served by a 40-HP York Shipley compressor and thermostatically controlled to 45 deg. F. Two loading lifts assist in dispatch.

Before any cheese leaves the factory samples from every batch are subjected to exhaustive tests in the company's laboratories, the electrical equipment of which includes ovens, refrigerators and moisture and centrifugal fat testers.

From the electrical installation point of view possibly the most interesting feature is the clean layout and the trouble taken to facilitate any alteration necessitated by rearrangement or extension of plant. The electrical contractors, T. Clarke & Co., Ltd., have placed all the conduit in easily accessible positions on angle brackets attached to the ceilings, while on the second floor, suspended lights have been eliminated and instead a system of indirect lighting has been adopted, utilising special G.E.C. fittings mounted on the top of the columns. Inset in these columns are special switch-plates each combining a 15-A control switch for these lights and a 5-A switch plug for an inspection lamp, &c.

Practically all the electric motors have individual control gear, an exceedingly neat layout being achieved by grouping all starters (mostly G.E.C.) on conveniently placed panels, some of which incorporate as many as forty units. Another neat arrangement is to be seen in the sub-main fuseboards for power and lighting. In these 60-A and 160-A English Electric h.r.c. fuse bases and bridges have been mounted up on strip iron, the bus-bars running straight through. All the local distribution boards for lighting throughout the building were supplied by Parmiter, Hope & Sugden, Ltd.

The main switchboard (Igranic) for the main building comprises a 1,500-A main circuit-breaker and twelve sub-switches for power and lighting on each floor. In the sub-station where the 400/230-V supply is received from the Metropolitan Electric Supply Co., Ltd., are situated three J. & P. cubicle type oil circuit-breakersone 2,500-A unit for the main control, a 1,500-A unit controlling the whole of the new factory, and a 800-A breaker for the cold storage, five English Electric h.r.c. breakers being employed for the other services. For power-factor correction one 130-kVA G.E.C. and two 40-kVA Dubilier condensers have been installed. The main equipment also comprises a voltmeter, ammeter, kVA meter and power-factor meter, the last being used in conjunction with the manual operation of the condensers to cope with fluctuating loads.

Among the equipment used in the installation are also J. & P. cable; Walsall conduit and switch-plates; M.K. switch sockets; Benjamin industrial lighting fittings; G.E.C. decorative lighting units for the directors' rooms, general offices, canteens, &c.; Claudgen neon signs; G.E.C. clocks; a Westinghouse refrigerator; and cookers, griller, chipper and fryer supplied by Air Ducts, Ltd. Most of the electric motors installed were made by Crompton Parkinson, Ltd., the remainder being of Metrovick or G.E.C. construction.

New Zealand Electrical Topics

MANY questions bearing upon practice in this country as well as in the Antipodes were raised at the recent annual conferences of the New Zealand Electric Supply Authority Engineers' Association and the Electric Power Boards' and Supply Authorities' Association, detailed reports of which appear in a special conference issue of the N.Z. *Electrical Journal.*

The engineers' conference, for instance, had before it the report of a committee appointed at the 1937 conference to determine a uniform basis for making tariffs. For domestic supplies, the committee recommended that a schedule should be adopted which included a certain number of kWh charged at a relatively high price, followed by one or more steps at a lower price. If it were felt that some basis (or excuse) was necessary for charging a block of kWh at a high price, the rooms basis should be adopted in preference to any other. There should not be more than four steps, with two as the objective, and there should be no restriction as to use.

In the committee's researches many strange schedules were brought to light. These led it to recommend that authorities should analyse sales at the end of the year and, if possible, install machines to do so month by month. Consumers should not be tempted into a lower step by making them guarantee a minimum consumption per month. Water heating should be quoted at so much per 100 W per month, avoiding long schedules. Consumers taking supplies for lighting, heating and cooking should not be offered a lower rate than equivalent consumers of lighting and heating only, as the former were bound to be on the peak. There should not be discrimination between winter and summer.

An outspoken statement of his views on the situation of the industry was made by Mr. H. G. Kemp (Ashburton) in his presidential address. The weakness of the industry, he thought, lay in the political control of one half of it—the generation side. Contrary to the idea of centralising the whole industry, he held that a satisfactory position would not be reached until the control of generation was decentralised and they, the load builders, were given some say in what plant should be installed. In a decentralised organisation there were many brains working in responsible positions, but in a centralised organisation the executive responsibility rested on one or two.

Mr. M. Cable, general manager at Wellington, was elected president of the Association for the ensuing year.

At the conference of power boards and supply authorities (president, Mr. J. A. Nash) a number of interesting proposals by member authorities were debated. One asked that in view of the announced policy of the Government further to popularise the use of electricity all duties upon electrical construction materials and appliances should be removed, but against this it was held that the effect would be to make the manufacture of electrical goods in New Zealand impossible, and the recommendation was lost.

A recommendation in favour of asking the Government to grant financial assistance towards extensions in sparsely populated areas was carried after a lengthy debate.

Organisations of the Industry—II

The Incorporated Municipal Electrical Association

By J. W. Simpson, F.C.I.S., F.S.S.

THE idea of a Municipal Electrical Association was put forward by Mr. J. H. Rider at a meeting of municipal electrical engineers in July, 1895, when a committee was appointed to draw up a constitution. Originally membership was confined to municipal engineers and an executive committee was formed consisting of Mr. Arthur Wright (president), Messrs. W. H. Arnott and C. H. Wordingham (vice-presidents), and Messrs. C. S. Vesey-Brown, Albert Gray, John Hesketh, A. B. Mountain, H. Faraday Proctor, J. H. Rider and W. L. Madgen (hon. secretary). Members of municipal electricity committees were invited to the first annual convention in 1896 and later were admitted to membership. Assistant engineers were able to become Associates. The objects of the Association were, *inter alia*, to promote the interests of municipal electrical undertakings and to that end to bring municipal electrical engineers into relationship one with another.

The Association was incorporated in 1901. Owing to the rapid growth of the Association, the necessity arose for a reconstruction of the constitution, and the membership was reconstituted in three classes—(*a*) members, (*b*) honorary members, and (*c*) associated members. The "members" are local authorities owning electricity undertakings. Honorary members are elected by the Association as an acknowledgment of the services which they have rendered as officers or members of the Council. Associated members are elected by the Council. These are persons who are or have been chief electrical engineers. The members, *i.e.*, the local authority, nominates and is represented by, a member of its electricity committee and its chief electrical engineer.

Mr. J. W. Simpson is Secretary of the Association

It is difficult to enumerate the many objects of the Association but the following gives some indication of its powers: To promote the interests of municipal electrical undertakings and to bring municipal electrical engineers and chairmen and members of municipal electricity committees together. This is achieved by holding periodical meetings for the discussion of subjects germane to municipal electrical undertakings.

To take such action as is lawful and expedient for the protection and defence of the rights or interests of municipal electrical undertakings, including the promotion or support of, or opposition to, legislative and other measures likely to affect them.

To establish a reading room, library and collection for purposes of research and for supplying information on electrical matters and to print and publish from time to time papers especially prepared for the Association, and any records, abstracts, etc., relating to electrical or allied undertakings.

To undertake such independent investigations and tests of materials, methods, and appliances as may be considered advisable, and to issue certificates of such tests and to accept fees or remuneration for these or other services, and to retain skilled advisers when it is desired to have independent legal engineering or other advice.

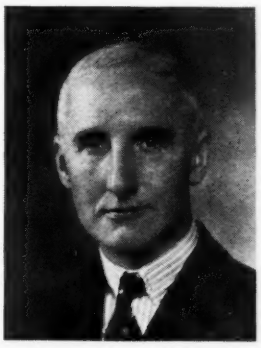
The powers of the Association also extend to the purchase or leasing of land and buildings, etc., which it can re-sell or sub-let if it desires. For this and other purposes it may borrow or raise money by the issue of or upon bonds, debentures, bills of exchange, promissory notes or other obligations or securities of the Association.

Membership and Management

The Association is empowered to admit any persons whether eligible for membership or not to be honorary members of the Association on such terms and to confer on them such rights and privileges as may seem expedient.

The membership of the Association is now 337; this is equivalent to 90 per cent. of the municipal electrical undertakings in Great Britain.

The Association is managed by a Council consisting of a president, vice-president, two immediate past-presidents, an honorary treasurer, an honorary secretary, and twenty-nine other members. Four of these members directly represent the four centres of the Association, *viz.*, the Mid-East England Centre, South-East and East England, the North-East England, and the Scottish Centres. In the case of ordinary members the period of service on the Council is three years, and a third of the members retire each year and are not eligible to serve again until one year has elapsed.



Mr. H. C. Lamb, this year's President of the I.M.E.A., is city electrical engineer of Manchester

There are eight standing committees and numerous subcommittees. There are also a number of joint committees with kindred associations and the I.M.E.A. is represented on a large number of bodies connected with the electrical industry. It is recognised as the medium between the Electricity Commissioners, the Central Electricity Board and Government Departments and municipal electrical undertakings.

Co-operation

The Association believes in close co-operation with other sections of the industry, and to this end (as mentioned above) has been instrumental in formulating joint committees whereby numerous matters may be discussed with the frankness which the subject deserves. It is not too much to say that great mutual benefit has been derived from this co-operation, and the Association hopes to continue its efforts in this direction. Joint committees have been formed with the B.E.A.M.A., the E.C.A., the Institute of Municipal Treasurers and Accountants, the E.L.M.A. and the C.M.A. The Association also confers with the E.A.W. and is always willing to lend a helping hand in its work.

It is impossible to give in an article such as this, even a slight insight into the work of the Association, and it would be difficult to refer to any particular aspect, as in so doing one might inadvertently give a totally wrong impression. Suffice it to say that the work of the Association in the past few years has grown to such an extent as to necessitate the securing of more commodious premises and the enlarging of the staff.

It is a noteworthy fact that a number of past-presidents of the Association are holding, or have held, important positions with the Electricity Commissioners and the Central Electricity Board.

In conclusion, reference must be made to the annual convention of the Association. From its inception this has been one of the most important of the Association's activities. The first one, held in London and Brighton, was very successful and each succeeding one has repeated this success and added to the Association's prestige. Incidentally, it was at the first convention that Mr. C. H. Wordingham, then city electrical engineer of Manchester and later President of the Institution of Electrical Engineers (he died in 1925) put forward the suggestion that municipal supply authorities should exercise some control over the wiring and devices connected to their mains. Resolutions were passed calling for a set of regulations and a sub-committee was appointed for the purpose of drafting such regulations.

If the importance of the Association may be gauged by the attendance at its annual conventions, then it can be said to be doing a great work for a great industry.

The first article of this series, dealing with the British Electrical Development Association, appeared in our December 2nd issue. The next covering the history and activities of the Electrical Contractors' Association will be published on December 30th.

Meetings and Discussions

Subjects of electrical interest discussed during the past week have been of a widely varied nature, including telegraphy, earthing electrical installations, means of starting oil engines, and applications of thermionic valves. How extensive is the telegraph system operated by Cable & Wireless, Ltd., was shown by Mr. K. L. Wood in a paper read to the I.E.E. in London last night. At present it comprises 155,090 nautical miles of submarine cables, 125 wireless circuits, and 161 overseas branches. Speaking to the Institution of Water Engineers last Friday Mr. H. W. Swann, Senior Electrical Inspector of the Home Office Factory Department, discussed regulations recently drawn up for controlling the earthing of electrical installations to water mains. Ingenious types of electrical equipment for assisting the starting of oil engines were described to the Diesel Engine Users' Association on Wednesday.

Empire Telegraph Communications

THE engineering aspects of telegraph communications, both wireless and submarine cable, within the Empire, are dealt with in the paper by Mr. K. L. Wood (Cables and Wireless, Ltd.) that was read at the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 15th.

To emphasise the size and scope of the undertaking the paper begins by setting forth the components of the operating company and indicating the systems contributed by each section. The engineering organisation within the operating company is then dealt with, the training and necessary qualifications of telegraph engineers in the present service being outlined.

The main traffic routes are discussed, with details of a number of main-line circuits. Some of the engineering requirements of the flow of traffic are touched on and the paper proceeds to enumerate the methods by which the collection and the delivery of messages are effected. The methods of signalling and the suitability of the different codes under varying circumstances are explained.

Cable Progress

The author then presents a short history of progress in cable telegraphy. Modern methods of signal shaping, balancing, and synchronous-regenerator working on cable circuits are reviewed briefly in the case of well-known methods, with fuller technical explanations where information has not previously been published except in patent specifications. Such items include the capacitance magnifier for increasing signalling speed. It combines the moving-coil principle with thermionic valves and 2 μA suffices to operate it, corresponding to an input of 1 μV. Normal received currents, after passing through the shaping networks are of the order of 10 μA in the case of a long cable and more over shorter cables, so being ample with a magnification of seven or eight to one to work the secondary relay. In special cases an amplification of 90 to 1 has been obtained with this instrument.

The secondary relay of the "fork" type is of the moving-coil class, but has the unique feature that the elements make contact when at rest. It functions reliably with 60 μA through the 500-turn 500-ohm coil, the movement of which can be observed for balance and signal-shape purposes by light reflected from a mirror harnessed to the coil. Since earth currents can reach the receiving network a bias corrector is necessary and is most conveniently applied to the secondary relay. It is of the magnetic clutch type and normally removes bias in 12 seconds. Normal earth current changes reasonably slowly; an instantaneous change of as much as 18 V (added potential to a long cable working with a 60-V sending battery) corresponds to severe magnetic storm conditions. In practice, the fork relay with bias corrector has functioned satisfactorily with earth currents causing bias "outnesses" up to three or four times the signal amplitude at the receiving end.

To obviate the delay involved in retransmission of signals at intermediate stations in a chain the terminal transmitting station can at any time complete the through circuit by "calling" the intermediate. This selective switching is done by two magnets, operated directly by the dot and dash relays, which rotate two camshafts in opposite directions by means of pawls and ratchet wheels. Normal traffic continually resets these camshafts, so that this remote switching causes very slight delay. The line time occupied by such a "call" is of the order of four seconds only on a circuit working as slowly as 1,000 signal elements per minute. Should incoming signal distortion grow sufficiently to risk failure of the retransmitted signal an alarm will be sounded by an automatic scrutiniser. This consists of a relay armature which is attracted at the beginning of a signal and released at the end, so charging and discharging two capacitors. The kicks so produced actuate the alarm relay.

Less costly methods of channelling, improved speed control and refinement of duplex balancing are briefly referred to.

Wireless Circuits

The author then outlines the methods of operating the wireless telegraph circuits controlled by the operating company, giving details of the application of regenerator working and a description of double frequency keying by means of which the intelligence is, in effect, conveyed twice by one transmission. The paper concludes with two examples, solar cycle and echo, of the effects of cosmic interference with radio telegraph circuits.

The present telegraph system comprises 155,090 nautical miles of submarine cables, 125 wireless circuits, and 161 overseas branches. In addition to these main systems there are various small wireless circuits and ship and aircraft services, the shore ends abroad of ship services and direction finding stations overseas for both sea and air services. Other activities include the London end of radio-phototelegraphy services with New York, Buenos Aires, Melbourne and Tokio; also land telephony in Cyprus and Peru and broadcasting in Kenya.

Systems and companies within the group number 25 (some now liquidated) and there are controlling interests in seven other companies as well as in a number of foreign wireless companies.

Almost all the Empire routes from the United Kingdom are served by both cable and wireless. London is the focal centre and through it at certain times of the day passes much of the traffic between distant parts.

The choice as between wireless and cable is primarily dependent on the sender's instructions, but the particular route is regulated in part by the outpayments that have to be made on the various routes, and depends very much upon the time of traffic flow, which again is mainly dependent upon the business times in various parts of the world. During the night, for instance, on a route which is served both by wireless and by cable the cable circuit may carry the bulk of the traffic, since the majority of the cable chain stations may have to be kept fully manned to serve other routes.

Earthing to Water Mains

IN a lecture to the INSTITUTION OF WATER ENGINEERS on December 9th Mr. H. W. Swann, Senior Electrical Inspector of the Home Office Factory Department, discussed the regulations for controlling the earthing of electrical installations to metal water pipes and water mains recently drawn up by a Committee of the Institution of Civil Engineers, of which Mr. S. B. Donkin was chairman. Good earthing, he said, was essential for the protection of life and prevention of fire, but in most urban districts the construction of a good earth plate or electrode would be difficult or impossible. The custom of using water mains for the purpose started with public electricity supply in 1882 and a change of practice would lead to accidents.

Examples of damage to water pipes and possible leakage paths from installations were illustrated by lantern slides. If DC flowed from a pipe it would cause damage, as with tramway DC supply systems, but the former were being replaced by trolley buses, while DC distribution was decreasing and now served only about one million out of ten million consumers. AC itself would have only about 0.05 of 1 per cent. of the electrolytic effect due to its DC equivalent, but there was the possibility of a partial rectification of AC leakage. In an experiment with a used tinned-copper clip on a galvanised-iron pipe, the inner surface of the clip had been corroded with oxide and carbonate of zinc. At 12 V AC the current passing was 100 μA as AC and 10 to 25 μA as DC; electrolytic deposition of copper confirmed the presence of a DC component.

DC was possibly also generated chiefly at initial joints by chemical action of long duration due to salts in the soil and contact between dissimilar metals. Damage due to earthing radio receivers and interference suppressors to water mains was, he believed, negligible, as the currents were AC and very small. Regarding electrode boilers, the Regulations of the Electricity Commissioners and of the I.E.E. limited the flow of out-of-balance currents, but owing to the direct connection of the water service to the boiler, they would probably not prevent it entirely. The boilers were always supplied with

Large Telegraph System Installation Earthing Starting Diesel Engines

AC, but if partial rectification to DC took place and the out-of-balance were persistent and not merely transient, damage might follow.

As no conductor was devoid of resistance and no insulation was completely non-conducting, there was a persistent aggregate leakage from installations which, taking into account the legally permissible figure of one-tenthousandth of the maximum current supplied, would find its way to water pipes by the earthing conductor. On the other hand, it would be mainly AC and its effects would depend upon the possibility of partial rectification.

The possibility of definite insulation failure provided the main reason for earthing. If disconnection of the faulty circuit were prompt, damage was unlikely, but if the leakage was less than the current at which the fuses or circuit-breakers operated it might persist, although it was then more likely to cause a fire than damage to pipes.

Discussing the Regulations, Mr. Swann noted that Cl. 1, which permitted an electrical installation to be connected to a water main as a safety measure for the purpose of returning leakage current to the source of supply or for radio-frequency currents, precluded direct connection to the neutral. Cl. 2 reasonably prevented the cutting, drilling or damaging of a water pipe when making an earth connection. Cl. 3 required every earth-connecting device to be of an approved design so that its current-carrying capacity would be proportional to the maximum possible leakage current. Cl. 4 provided for the approval of the water authority to earth connections to buried water main or water pipe, and Cl. 5 for the short-circuiting of any water meter free of expense to the water authority. He regarded Cl. 6, which related to tests for current leakage, to be carried out (preferably by the electricity undertaking) as a great advance in the right direction of co-operation between electrical and water engineers.

Electrical Aids to Engine Starting

A SYMPOSIUM on the starting of oil engines was presented for discussion before the DIESEL ENGINE USERS' ASSOCIATION in London on December 14th.

Some engine makers submitted observations on design and operating factors that influence starting, and Ricardo & Co. (1927), Ltd., included a list of aids to cold starting. Among these are electric heater plugs and electric air intake heaters, the latter needing to be of 200 W per litre of cylinder swept volume. Such aids reduce the need for sustained application of the starting motor, so lengthening the life of the battery which drives it.

Other makers furnished details of the equipment they employ for starting various sizes of engine, which showed that compressed air is the agent most commonly used, although W. H. Allen, Sons & Co., Ltd., for special requirements, have fitted small high-speed engines with electric starters generally similar to those used on road vehicles. Crossley Brothers, Ltd., indicated that electric starting is more usual on the larger of their high-speed vertical engines.

Two distinct electrical systems are commonly utilised by Davy, Paxman & Co., Ltd. One is to couple a series-wound motor directly to the crankshaft, or by means of a vee-belt and pulleys. The other and more generally used system, which is suitable for engines with up to eight cylinders of 5½ in. bore and 7 in. stroke, is particularly applicable for marine and traction purposes. It makes use of an automotive-type motor operating from a relatively small storage battery at 24 V and fitted with a Bendix pinion which engages with a toothed ring secured to the flywheel or to some other convenient place on the crankshaft. Remote push-button control can be employed and the motor is disengaged until current flows through the windings, when the combined axial and rotary movement of the armature causes the Bendix pinion to spin along the spiral-grooved spindle of the motor and engage with the toothed ring referred to. When the current ceases to flow and the armature comes to rest the pinion is spun back again into starting position by the effort of the toothed ring.

A Change-over System

Mr. E. P. Paxman mentioned impulse starting by means of an explosive compound fired electrically in a starting " gun " applied to the end of the crankshaft. He also drew attention to the particular usefulness of automatically controlled emergency generating sets, operated by a low-voltage relay and contactor gear. When the Diesel engine has been started the driving motor can automatically be changed over to function as a generator for the purpose of recharging the battery.

F. Krupp A.G. (Kiel) suggested that space and weight considerations made the electrical starting of small high-speed sets preferable to the use of compressed air. They also drew attention to the practicability of starting from the electrical side, especially in ships fitted with Diesel generators for auxiliary or propulsion purposes.

Mirrlees, Bickerton & Day, Ltd., referred to several sets of 150 to 600 kW that they have built for automatic starting under emergency conditions. They are arranged to come into operation on the failure of the incoming supply and to take care of themselves until the main supply is restored. In addition they can be started and stopped by hand and remotely by push-buttons. A starting motor in combination with compressed air is employed, the compressor being also automatically actuated by pressure-limit switches. The electrical circuit governing the sequence of events is fully protected by patents.

The National Gas & Oil Engine Co., Ltd., regarded electric starting as being confined to small engines of the multi-cylinder type. It stated that to start an engine having four cylinders of 4¼ in. diameter and 6 in. stroke (with decompressor in action) requires 160 A at 9.5 V, which confirms the turning effort needed for hand starting, say, 63 lb.-ft. and about eight revolutions.

Ruston & Hornsby, Ltd., utilise two automatic systems. One is for emergency conditions, causing the set to start on failure of the main supply and to stop when restoration is completed. It can also be operated by thermostat or pressure, or remotely by push-buttons. The other method is applied mainly to country house lighting plant, the main object being to keep down battery cost.

In this case the generator has three independent field windings. The first is the conventional shunt, the second is in series with the external load and the third is included in the battery charging and motor starting circuit. The several windings work together in such a way that the winding in series with the external load will, under the conjoint action of the shunt and battery charging windings, maintain the potential on the armature, as distinct from the line voltage, constant notwithstanding load variation. The winding in the battery charging circuit produces a field which is in opposition to that of the shunt and series windings when the dynamo is generating and its value is so arranged that it will allow a definite trickle charge to the battery, the amount of trickle being manually controllable.

Sulzer Brothers (London), Ltd., indicated that they make stationary engines for electric starting from 40 up to 120 HP and automatic sets up to 100 kW, the latter with an alkaline battery of 100 Ah at either 12 or 24 V. A 1,600 BHP set now being installed is arranged to be started and stopped by push-buttons remotely from the central switchboard of a large power station. Sulzer Diesel-electric locomotives usually employ the generator as a starting motor; when the drive is mechanical a separate starting motor is provided with a Bendix coupling.

Thermionic Valve Applications

APPLICATIONS of the thermionic valve for purposes other than radio were explained in simple language by Mr. H. J. M. Riddle in a paper read before the JUNIOR INSTITUTION OF ENGINEERS in London recently.

The author's aim was to dispel some of the prevailing feeling of mystery with which those not acquainted with the subject are inclined to regard it. With the aid of original diagrams and exhibits he outlined the structures and characteristics peculiar to the several classes of valve, pointing out that in the case of the evacuated type the anode current was a function of the grid voltage. Thus control could be effected without the consumption of appreciable energy, in contradistinction to electro-magnetic devices in which the operative factor was current rather than voltage. This attribute was often overlooked and another invaluable feature was the instantaneous change of anode current brought about by grid voltage adjustment, this being a unique control feature.

The author dealt in detail with some of the many commercial applications of thermionic and photo-electric devices, mentioning also how very slight changes in mechanical pressure could be registered piezo-electrically with the aid of an electrometer type triode valve providing an output current sufficient to operate quite ordinary measuring instruments. Apart from the use of valves as generators of high frequency AC, there were also rectifiers and a stabiliser type which furnished a DC output practically independent of variations as great as ± 20 per cent. in the AC input.

Electricity Supply Progress

THE distribution and development of electricity supply was the subject of an address by Mr. H. S. Ellis (Gloucester), chairman of the Western Centre of the INSTITUTION OF ELECTRICAL ENGINEERS, at Swansea last week. Some criticism had lately been levied against electricity supply in this country, said Mr. Ellis, but when it was noted that out of 12,000,000 homes

10,000,000 consumers were connected with the mains, it was clear that the position was not so bad as it had been painted. However, there was room for reorganisation, especially in the rural areas. Following the address a general discussion took place. Mr. J. E. Dawtry presided.

Forthcoming Events

Institution of Electrical Engineers.—Monday, December 19th. Institution, London, W.C.2. 7 p.m. Informal meeting. Discussion on "Poynting's Law and the Transmission of Energy," to be opened by Prof. W. M. Thornton.

Wireless Section.—Monday, December 19th. Institution, London, W.C.2. 6 p.m. "The Development of Television in Germany," by Herr Ministerialrat Gladenbeck.

Birmingham Electric Club.—Monday, December 19th. Grand Hotel, Birmingham. 7 p.m. Annual general meeting.

Illuminating Engineering Society (*Industrial Lighting Section*).—Monday, December 19th. 2, Savoy Hill, London, W.C.2. "Light in Relation to Production," by Mr. T. E. Catten.

Electrical Power Engineers' Association (*Chester and North Wales Section*).—Tuesday, December 20th. Technical Institute, Wrexham. 7 p.m. "Some Recent Developments in High Rupturing Capacity Switchgear," by Mr. J. P. A. Meldrum.

Association of Supervising Electrical Engineers.—Tuesday, December 20th. 2, Savoy Hill, W.C.2. 7.15 p.m. "The Electricity Commissioners in Relation to the Powers of Public Supply Authorities," by Mr. J. C. Dalton.

The Sydney Undertaking

"Chief's" Post Advertised

THE Sydney (N.S.W.) County Council has advertised in the Australian newspapers for a general manager of its electricity undertaking to succeed Mr. H. R. Forbes Mackay who has held the position for some years.

The services of the successful applicant will be required to be available about June 1st next; he will assume the functions and designation of general manager about October 8th, 1939. The salary (£3,000 per annum subject to superannuation payments) will commence from the date upon which the new manager's services become available. The appointment will be terminable by three months' notice on either side and the retiring age is sixty-five.

The appointment will be made in accordance with the terms of the Gas and Electricity Act, 1935-36, of New South Wales, which stipulates that the Council shall appoint "a person chosen solely on the basis of his executive and administrative experience and qualifications."

Applications must reach the secretary of the Sydney County Council (Box 4009 VV., G.P.O., Sydney, N.S.W.), by January 24th. Each application must set out the date and place of the applicant's birth and his nationality and briefly the qualifications and experience which make him suitable for the position. Copies of testimonials covering the period from 1929 to 1938 should be sent.

As an indication of the magnitude of the position a number of details of the undertaking are set out. The Council supplies electricity to 248,500 users in an area of 150 square miles with a population of 896,000, and in bulk to fifteen public bodies and companies in an area of 747 sq. miles with a population of 148,500. The sales in 1938 will amount to about 568 million kWh and the gross revenue to nearly £3,000,000. A total of £20.5 million has been expended on the undertaking; the plant capacity is 226,000 kW and the maximum demand has been 176,000 kW. The undertaking has over 3,000 officers and employés of all grades.

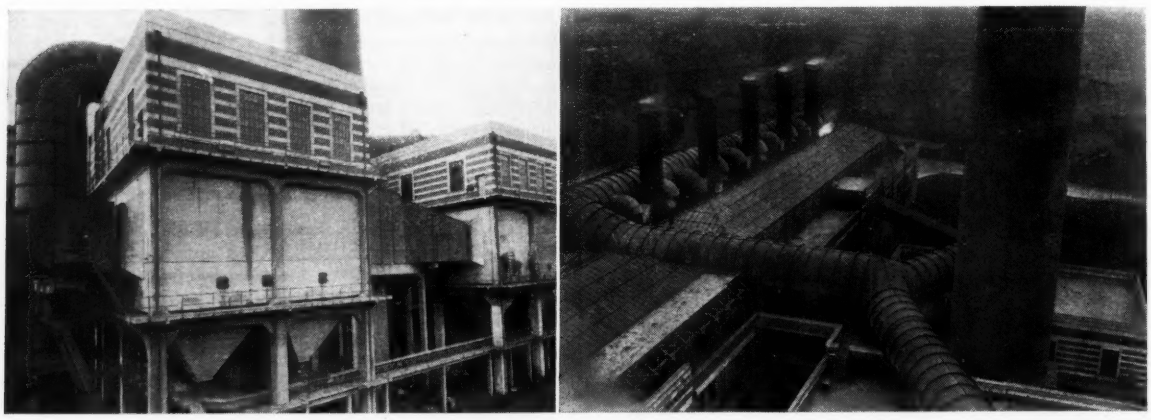
Here and There

By Nomad

I THINK I can claim to be one of the first few visitors to the new Hams Hall B power station of the Birmingham undertaking, for when I was there recently the first contractors in the field had been engaged for a fortnight in making the road to the new site. My best view of the new site was from an upper storey of the boiler house of Hams Hall A, looking east for about half a mile. Although it will be a couple of years or so before the new station is running it is a point of interest that the first station is still incomplete. True, it has its full complement of 240,000 kW of turbo-alternators, but to complete the boiler plant another 250,000 lb. per hour unit still has to be installed.

* * *

Although only about nine years old, Hams Hall A has the most interesting power station history that I know of. Starting with pulverised fuel firing for the first eight boilers (five 180,000 lb. per hour and three 250,000 lb. per hour), a change to stoker firing was made for the remaining six 250,000-lb. boilers. Elaborate precipitation plant for flue-gas cleaning was added at an interim stage and a reflection of the 1926 Act was the rewinding on site of the initially installed alternators for conversion from 25 to 50 cycles. In view of the modern tendency I am a little surprised that the initial steam conditions have been maintained throughout, but I understand that the steam for the new station is likely to be at 600 lb. per sq. in. and 800 deg. F.



Flue gas treatment plant at Hams Hall. Left: Electro-filter structure and flue gas ducts. Right: Ducts connecting boiler outlets to electro-filter chambers

* * *

The swing back to the initial firing system for the new station will, I believe, prove to be a crucial point in power station development from the aspect of fuel economy, and I say this with an eye on the undertaking's experience in p.f. firing at Nechells and with a knowledge of the intense interest in fuel economy taken by Mr. Forrest, the chief engineer, and his predecessor, the late Mr. Chattock.

* * *

It is refreshing to be able to write in this way about p.f. firing after a disappointment in the apparent lack of enthusiasm in the subject for a few years, but I must confess to a leaning towards the combined system of firing (p.f. and stoker). After all, the creation of one unit from the best components or principles of a number is almost a basic ideal in the engineering mind. Little has been heard of this idea of late, but it met with considerable success in a few cases in this country a few years back. I recall the keen interest which was shown in the scheme at Liverpool, and Mr. Skelton, of Merz & McLellan, told me with enthusiasm recently how p.f. firing at Barking added to the flexibility of the station at peak load times. To handle 15,000 kW completely in half an hour is no small achievement. I was encouraged only this week to see that the principle is also to be adopted at the Littlebrook (Dartford) power station of the Kent Electric Power Co., where p.f. boilers are being installed to serve the two initial 30,000-kW turbo-alternators and stoker boilers are to supply the 60,000-kW base-load set.

* * *

I know that the operation of power stations is vastly different in these days of "master control." I also know that many boiler-house engineers hesitate to express their ideas on their subject and I think it would be a great pity if progress were retarded by the fear of offending the higher powers.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Electrolytic Condensers

WE would like to refer to an article which appeared in your issue of August 12th relating to the deterioration of electrolytic condensers with particular reference to their application to AC capacitor motors, where it is recommended that when an electrolytic condenser is known to have been standing idle for six months or more it should be re-formed before being put into service. The author explains that this is necessary owing to deterioration of the film, which he believes takes place during the idling periods. We are not able to accept this view.

Experiments on condensers which have idled for periods up to two years show that if any deterioration of the film occurs it is so slight that no re-formation is required. It is unlikely that in practice condensers will be left unused for longer than two years, but should this occur, it must be remembered that an electrolytic condenser when used on AC has the property of maintaining the formed foils at a potential positive with respect to the electrolyte so that any slight deformation of the film is automatically repaired.

It is our opinion, therefore, that in a properly designed and manufactured condenser, deterioration of the film takes place so slowly that it may be disregarded as having an adverse effect on the performance of condensers of this type which have been idling for reasonable periods as may be experienced in ordinary commercial use. The application of electrolytic condensers to motors is by no means experimental; they have been used successfully for several years.

North Acton, W.3, *December 12th.* — TELEGRAPH CONDENSER CO., LTD., P. A. SPORING, *Works and Technical Manager.*

Fish-scaling Methods

We notice in your issue of December 9th (page 834) you make reference to a new fish-scaling machine produced by a Chicago company.

It may prove interesting and of value to many of your readers to know that fish scaling can quite satisfactorily be performed on the regular carborundum-lined potato peelers which operate by means of a rotating bottom plate. Many of our users in the fish business have found their regular potato peeling machines of value in the scaling of herrings and similar fish without any damage whatever to the fish.

An interesting point that has never been properly explained is that when a bucket of fish is emptied into the machine the fish rotate automatically tail first, that is, against the scales, thus resulting in the scaling action.

New Southgate, *December 12th.* — HOBART MANUFACTURING CO., LTD., G. E. MYNOTT, *Sales Department.*

Sagging Overhead Line Conductors

It is difficult to reconcile Mr. W. A. Rushton's remarks regarding price cutting in your issue of December 2nd with his admission that he has yet to meet the linesman who can even memorise the formula, let alone work it out. Surely skilled and intelligent linesmen and low prices go together, since it is the former (leaving out material cost) who make the latter possible. I could introduce Mr. Rushton to linesmen who can both work out and apply the formula.

In contract work under most eminent consulting engineers in Britain, the regulation of overhead conductors is governed by two factors, tension and sag. It is therefore imperative that a dynamometer shall be used on each conductor. The conductors have to be pulled up to worst load and left for some time to take out the stretch. They are then let out to the tension corresponding to the temperature, the sag being used as a check. If employing battens it is customary to select a comparatively level span with conductor formation the same on the adjacent poles. This often entails selecting a span away from the tensioning points with the usual transporting of ladders for batten erection (climbers are taboo). The time to prepare for this operation and the labour entailed is far in excess of that of merely flicking a conductor for a short time and recording the vibrations since this can be done on any span. Surely the letting out and pulling in a conductor by any of the modern pullers is not such a colossal job as Mr. Rushton makes out.

At times all engineers encounter valleys where extra long spans are the only solution. I have in front of me some figures of long spans I had to construct, as a contractor's engineer, where the sag corresponded to a value similar to that of the pole heights. If a dynamometer were regarded as an extravagance, I am afraid that sagging under such conditions with battens would make a queer job.

In conclusion, I would mention that where aluminium conductors are being erected, with stirrup binding under the lip of the insulator, uplifts of a "limiting" value are successfully practised and permitted on many contracts.

Leeds, *December 10th.* — J. MCCOMBE.

I was quite interested to read Dr. John McCombe's article in your issue of November 25th and Mr. W. A. Rushton's answer in the following issue in connection with a method of sagging conductors by means of noting the reflection time of induced vibrations in the conductor.

I also am of the opinion that the idea, as expressed by Dr. McCombe, has much more of an academic than a practical flavour and I think that Mr. Rushton hits the nail on the head when he says "I have yet to meet the linesman who could memorise such a formula, let alone work it out correctly."

My main purpose in writing this letter, however, is in case it might be of interest to some of your readers to know that a practical utilisation of Dr. McCombe's idea has been available for many years now. I refer to the type of sag meter, which consists of a simple stop watch calibrated in seconds in the ordinary way and also having a second concentric scale in feet or metres as desired. To operate this meter one sets up a vibration in the conductor and at the same time starts the stop watch running. The watch is stopped upon the return of the third reflection and the meter then indicates the sag directly. The calibration of the instrument is derived from a similar formula to that mentioned by Dr. McCombe, but it can be easily seen that the whole idea is more practicable.

I do not believe that such a meter has actually been used for sagging a conductor, but I do know that, as a rough check, it is a very useful device. R. T. WARD,

London, W.C.2, *December 7th.* ALUMINIUM UNION, LIMITED.

In your issue of November 25th, Dr. John McCombe directs attention to the merits of the method of determining the sag for overhead conductors by counting the vibrations in a fixed time. A sub-heading describes it as "a novel method." How long it has been known is hard to say, but telegraph engineers will not have forgotten the valuable article on the subject contributed in 1909 by Heinrich Dreisbach to the *Elektrotechnische Zeitschrift* (p. 1218). To physicists the method ought to appeal because of the nature and character of the "pendulum" involved in the problem.

In a short paper published in the *Proceedings* of the Institution of Civil Engineers, No. 9 of 1923, I gave an analysis treating it as a true catenary. The result indicated that the method is trustworthy over a remarkably wide range. It is pleasing to find in Dr. McCombe's article confirmation from practice that it answers the purpose. ROLLO APPLEYARD.

London, W.2, *December 8th.*

Referring to Dr. McCombe's article on this subject, I would point out to him a relationship simpler to memorise than the one given by him: "The time of one vibration in seconds is equal to the sag in feet."

This is correct to 1 per cent., as will be seen by inverting Dr. McCombe's equation, where $\sqrt{3650}$ equals 60 within 1 per cent. S. F. M. W.

December 7th.

Electricity Works Air-raid Shelter

A REINFORCED concrete chamber 20 by 7 by 7 ft. high has been constructed at the Nuneaton Electricity Works for accommodating the staff during an air raid. The sides and floor are 3 ft. thick and the roof (which is strengthened by 12 by 8 in. steel girders longitudinally and laterally) is 4 ft. thick. The ceiling is composed of steel tank plates sprayed with cork dust. The floor is 8 ft. below ground level. Double gas-proof iron doors seal the main exit and the emergency exit at the other end; between the doors of the emergency exit are the sanitary arrangements. The flat roof is suitable as a loading platform for heavy goods.

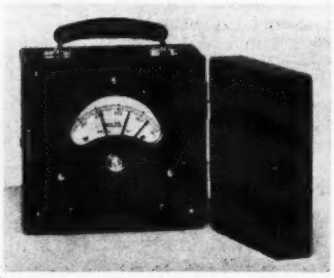
Seats are provided for twenty persons and standing accommodation for ten more, who could remain in the chamber for 2½ hr. without discomfort. Lighting is either from the town mains or from a 12-V battery. A telephone system is connected to the underground telephone cables of the undertaking so that messages can be sent to or received from forty sub-stations. These can be connected also to a separate telephone cable which has been run to the main control room in the basement of the Council House. A first-aid box and emergency tools are also provided. The whole of the work (including the electric welding of the gasproof doors and frames) was carried out by the staff of the Electricity Department under the direction of Mr. S. C. Gibson, borough electrical engineer and manager.

New Electrical Products

A review of equipment recently marketed

Maximum and Minimum Voltmeter

A MAXIMUM and minimum voltmeter has been designed by THE P. & B. ENGINEERING CO., LTD., Tamworth Lane Works, Mitcham, to meet the need for a simple, inexpensive and robust instrument which will indicate the maximum and minimum voltage which has occurred apart from momentary fluctuations. It is made in two patterns. A portable pattern, generally for use on consumers premises, and a switchboard pattern for sub-station use.



The P. & B. maximum and minimum voltmeter

The voltmeter operates on the thermal principle and has a movement which is similar in all essentials to the " P. & B." maximum demand indicator. It is fully compensated for variations in ambient temperature over a wide range. In addition to the instrument needle, it is fitted with maximum and minimum pointers indicating the voltage variation which has occurred since they were last reset. Two concentric knobs on the cover are provided for setting them after the voltmeter is on load. It is suitable for use on AC only.

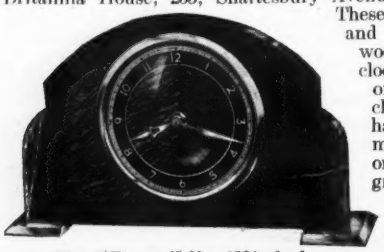
The instrument has a time lag of 10 mins., so that momentary variations in voltage do not appreciably affect the readings, but the shape of the time lag curve is such that 50 per cent. of the indication is shown in 2 min.

The standard ranges available are from 170 to 260 V for checking the voltage on lighting circuits, from 340 to 520 V for power circuits, and from 80 to 130 V for operation from potential transformers in sub-stations.

Due to a set-up zero, the scale is particularly open and the normal voltage on each range is approximately at the middle of the scale. The accuracy is in accordance with the limits specified for first-grade voltmeters in B.S.S. No. 89-1937.

Electric Clocks

Two additions have recently been made to the range of "Temco" clocks marketed by T.M.C.-HARWELL (SALES), LTD., Britannia House, 233, Shaftesbury Avenue, London, W.C.2. These are models 4000 and 4001. Both are wooden cased mantel clocks available in oak or walnut with a chromium bezel, hands and feet, with matt silver figures on a black background. A " Bijou " movement is employed and the glass is convex. The measurements are as follows: No. 4000, 7 in. wide by 5¼ in. high by 2⅛ in. deep; No. 4001, 8¾ in. wide by 5 in. high by 2¼ in. deep.

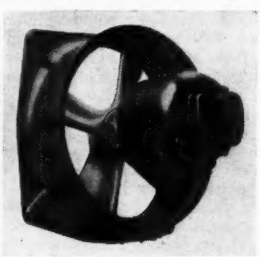


The "Temco" No. 4001 clock

Propeller Fan

A 12-in. propeller fan embodying advanced aero-dynamic design is announced by DELCO-REMY & HYATT, LTD., Grosvenor Road, London, S.W.1.

Quietness and absence of air turbulence is claimed by the makers by the use of dynamically balanced blades of aerofoil section, resilient streamlined motor mounting and silent motors. The fan is available for AC and DC and with special blades for working against pressure. It is especially applicable to unit heaters and coolers, cold-room air circulation, extraction of fumes from factories and the general ventilation of public buildings. The fan is finished in aluminium, black or grey, in each case the blades are coloured in red.



The new " Delco " fan

The motors, which comply with B.S.S. 170/1926, are totally enclosed and continuously rated. The windings are subjected to two immersions of varnish and baked, and the iron circuits are lamination assemblies hydraulically pressed together. The fan ring is a cast-iron duct with bell mouth inlet and outlet, and the terminal box with conduit connection is integrally cast at the bottom. Models are available operating at 920 RPM (550 cu. ft. per min., 30 W) and 1,460 RPM (1,100 cu. ft. per min., 70 W). The voltage range is 200/250 V, 50 cycles, single phase, 380/440 V three-phase and 200/230 and 230/250 V DC.

A Pedestal Fan

The latest introduction by MARELLI & CO., LTD., Artillery House, Artillery Row, Victoria Street, London, S.W.1, is a range of portable pedestal fans for ventilation in the open, dance halls, cinemas, public places, and any position where a permanent installation is impracticable.

The fan proper is mounted on a tubular column with a heavy circular base. There is a 16-in. oscillating model, a 16-in. revolving type, and a fan fitted with two sets of 14-in. blades arranged back to back at opposite ends of the motor shaft, on the same lines as the standard " Duo " table fan.

The Marelli pedestal fan

An Inductor Switch

Improvements in the design of the Greenly inductor switch are announced by INTERNATIONAL ENGINEERING CONCESSIONAIRES, LTD., 2/3, Duke Street, St. James's, London, S.W.1.

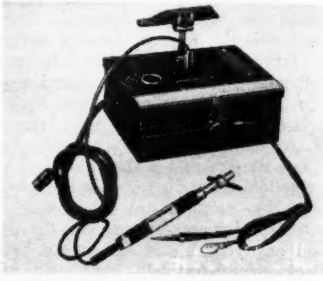
Instead of springs, a dynamically balanced armature, pivoted on miniature ball bearings, is constructed in two parts and so coupled as to move in opposite directions between two magnets. When the inductor member is passed through the field between the pole pieces the attraction of the main magnet is lessened, whereupon the retracting magnet takes control and causes the armature to make or break contact.

For counting railway vehicles in and out of signalling sections, the treadle type of switch is said to be capable of registering wheels travelling at 120 m.p.h., corresponding to 35 responses per second. This side-influence type of switch can also be employed for automatic train control, while a gap-type with divided pole pieces is adaptable for lift control, for the operational regulation of industrial machinery, and will function as a position indicator.

All contacts can be hermetically sealed; the metallic casing can be exhausted, filled with an inert gas or with oil. In this case contact is made or broken by rotating a single circular magnet through a small angle by means of a projecting arm, for use in corrosive or inflammable atmospheres. The armature and gap width are adjustable, while electro-magnets may be incorporated or the permanent magnets may be moderated by introducing wound coils into their flux circuits. Operation is positive in any position with the inductor element and switch moving relatively to each other at very high speeds.

An Arc Solderer

RUNBAKEN ELECTRICAL PRODUCTS, 13-15, Liverpool Road, Deansgate, Manchester, 3, announce the introduction of an arc solderer with infinitely variable control obtained by means of a sliding contact which connects with each turn of the secondary winding. A foot switch is incorporated.



The Runbaken arc solderer

In other respects the solderer is similar to the existing " Instanta" model, making brazing and silver soldering a simple matter without a blow pipe.

High Vacuum and Pressure Pump

Laboratory and factory workers concerned with the fast pumping of air should be interested in the " Pressovac " outfit announced by W. EDWARDS & CO., Vaughan Road, Loughboro' Junction, London, S.E.5. It is unusual in that the same oil-charged pump will exhaust down to a vacuum represented by 0.1 mm. Hg. and also compress air up to 10 lb. per sq. in., its displacement being 1.2 cu. ft. (34 litres) per minute.

The pump is motor driven by a pulley and belt, both machines being mounted side by side on a common iron base plate. A bell jar can be supplied to fit directly on top of the pump, or nozzles provided for rubber vacuum tubing. The outfit should be specially convenient for lecture and demonstration work.

Some African Markets

After an excellent year's trade there are signs of a temporary setback

IN Africa, besides the Union, there are a number of good markets for electrical equipment although these outlets are at present somewhat clouded owing to the weak state of the markets for many of the raw materials produced there.

Very nearly a record was scored by Nigeria in its external trade last year. Imports were 35 per cent. up on 1936, exports improved by 29 per cent., and the favourable commodity balance was £4,811,000. The share of the United Kingdom in the total trade remained at 64 per cent. At the close of the year there were signs of contraction of business and the Comptroller of Customs says in his recent report that it may be some time before collections will reach last year's total. He bases his comment on the high level of imported stocks in the country and the lower level of prices realised for Nigeria's exports.

The Gold Coast can look back on 1937 as a highly satisfactory year of trade. Customs and Excise receipts, at £3,289,000, were £518,000 more than in 1936 and the highest on record. Although cocoa was still the most valuable export, accounting for nearly two-thirds of the total, there were useful increases in gold, diamonds and manganese. On the other side of the account imports rose in value by approximately 40 per cent., under the influence of the advance in the price of cocoa which took place in 1936-37. This year trade has suffered from the trouble in the cocoa business and the hold-up of supplies by growers. Government control of exports was introduced in April in order to ensure the orderly marketing of the new crop. A Commission of Inquiry appointed to investigate the whole situation has issued its report. Its main recommendations are that the buyers shall discontinue their 1937 agreement and revert to free competition, and that the Gold Coast growers shall form a central sales organisation.

In Southern Rhodesia a favourable factor is the sound state of the tobacco industry, whose sales for the past season reached the record total of £1,100,000. The country's favourable balance of trade during the first half of 1938 was £883,000 compared with £1,847,000 during the corresponding period of 1937, the falling off being due largely to increased imports of electrical goods, railway material and motor-cars. At the same time exports increased by £87,000. An irrigation scheme to cover 100 square miles of land around the Umshandige Gorge is nearing completion. The Bulawayo Steel Works has started operations.

In Uganda the weakness of prices of the country's staple commodities, notably cotton, has caused some anxiety, but in a recent statement to the Legislative Council the Governor said there was no cause to view the future with misgiving. A Commission of Inquiry has been appointed to make recommendations for the improvement of the cotton industry.

In Tanganyika Germany's claims and the decline in the price of export commodities have clouded prospects, and stocks of imported goods are reported to be heavy. But the territory experienced great prosperity last year when imports, exports and revenue were all at a record level, and the purchasing power of the native population showed a marked advance. There was then quite an influx of capital for industrial development accompanied by increased imports of materials needed for this purpose. Another feature of the import trade was the rise in the quality of the articles sold.

In the accompanying statements, which are extracted from the official trade returns of the respective territories, are shown the leading items of electrical imports in 1937, with notes of increases or decreases compared with the preceding year.

NIGERIA

	1937 £	Inc. or dec. on 1936 £
Electrical and telegraphic apparatus—		
Total	30,000	− 14,050
From United Kingdom	7,300	− 11,300
,, U.K. Government	14,300	− 300
,, United States	3,400	+ 180
Electrical machinery—		
Total	40,400	+ 33,340

GOLD COAST

Electrical and telegraphic apparatus—		
Total	173,000	+ 79,000
From United Kingdom	135,000	+ 59,700
,, Hong Kong	10,000	+ 4,000
,, Germany	10,000	+ 4,900
,, United States	10,000	+ 7,400
,, Japan	3,500	+ 1,500
Electrical machinery—		
Total*	168,000	− 32,000

KENYA AND UGANDA

Electric wire and cables—		
Total	57,700	+ 40,200
From United Kingdom	48,200	+ 34,400
,, Germany	5,200	+ 4,700
,, Belgium	4,300	+ 1,300
Lighting accessories and fittings—		
Total	18,300	+ 12,500
From United Kingdom	15,300	+ 11,500
,, Belgium	2,000	+ 300
Electric light bulbs—		
Total	6,000	+ 2,800
From United Kingdom	4,500	+ 1,700
Electrical goods and accessories not elsewhere specified—		
Total	36,600	+ 7,400
From United Kingdom	23,700	+ 3,100
,, Hong Kong	3,200	+ 1,600
,, United States	1,900	+ 500
,, Germany	2,900	+ 1,000
Telegraph and telephone material—		
Total*	13,700	− 3,500
Radio apparatus—		
Total	27,600	+ 8,700
From United Kingdom	11,600	+ 6,100
,, Holland	5,000	+ 2,100
,, United States	9,300	− 100
Electrical machinery and parts—		
Total	57,900	+ 30,300
From United Kingdom	46,100	+ 26,200
,, Germany	4,700	+ 2,600
,, Belgium	3,500	+ 300
,, United States	2,400	+ 1,100

SOUTHERN RHODESIA

Electric cable and wire—		
Total*	123,000	+ 74,000
Government imports	8,800	+ 2,700
Electric lamps—		
Total*	16,500	+ 2,500
Electrical material not elsewhere specified—		
Total	35,900	+ 5,900
From United Kingdom	21,300	+ 6,900
,, Canada	5,200	+ 400
,, Germany	1,800	+ 600
,, United States	3,400	+ 700
Radio material and apparatus—		
Total	54,000	+ 11,000
From United Kingdom	6,600	− 1,200
,, United States	29,300	+ 6,900
,, Holland	16,200	+ 6,600
Telegraph and telephone material and instruments—		
Total trade imports	2,700	+ 1,700
Government imports	16,000	− 9,000
Batteries—		
Total trade imports	18,500	+ 800
From United Kingdom	11,400	− 900
,, United States	5,100	+ 1,100
Government imports	900	+ 400
Motors—		
Total	48,600	+ 17,600
From United Kingdom	42,000	+ 13,800
Transformers—		
Total	51,400	+ 37,900
From Germany	3,800	+ 3,500
Other electrical machinery—		
Total trade imports	129,000	+ 63,900
From United Kingdom	109,000	+ 53,100
,, United States	7,300	+ 2,300
,, Germany	8,500	+ 5,600
Government imports	6,600	+ 5,900

TANGANYIKA

Electric lamps—		
Total	1,900	+ 700
From United Kingdom	840	+ 470
,, Germany	610	+ 120
Insulated wires and cables—		
Total	4,400	+ 900
From United Kingdom	4,100	+ 1,000
,, Germany	300	—
Electric wires and cables, uninsulated—		
Total*	7,600	− 4,400
Telegraph and telephone instruments and apparatus—		
Total*	5,400	+ 2,400
Radio apparatus—		
Total	12,500	+ 1,600
From United Kingdom	3,900	+ 1,700
,, United States	5,900	− 1,000
,, Germany	1,100	− 100
,, Holland	1,300	+ 300
Electrical goods and apparatus not elsewhere specified—		
Total	21,900	+ 2,000
From United Kingdom	15,500	+ 200
,, Germany	3,200	+ 1,300
,, Japan	600	− 110
Electrical machinery and parts—		
Total	19,100	− 1,100
From United Kingdom	13,800	− 3,600
,, Germany	3,500	+ 1,500

* Mainly from United Kingdom.

Electricity in Mines

AS from March 1st, 1939, firemen, examiners and deputies must use for statutory inspections both a flame safety lamp and an electric safety lamp (which may be combined), each of a type approved for that purpose. This requirement does not apply to mines in which inflammable gas is unknown. A Deputies' and Shotfirers' (Safety Lamps) Order issued by the Mines Department sanctions the use for this work of certain of the safety lamps already approved for more general purposes and lays down conditions of use. A wide choice of electric lamps is available. Lamps used under this Order are excluded from the scope of the Safety Lamps (Conditions of Use) Order, 1934.

A new Explosives in Coal Mines Order requires shotfirers to use in examinations for inflammable gas the same types of flame safety lamps as are required for firemen, examiners and deputies. The use of an electric lamp in addition is not compulsory for a shotfirer, but if he does use an electric lamp it must be of an approved type.

Another Order amends the Safety Lamps (Re-lighting) Order of 1929 by deleting the requirement that shotfirers and others using a flame lamp fitted with an internal re-lighter must carry an electric lamp for the purpose of examining the flame lamp if it is extinguished in a manner that renders it unsafe. Firemen, examiners and deputies will not be affected in so far as they are now required to carry an electric lamp.

A fourth Order, the Telephones and Signalling Apparatus Order, approves such apparatus, coupling units and contact makers and prescribes the conditions of manufacture, installation and use. Alterations must not be made in the apparatus except as may be permitted by a subsequent certificate of the Department. Sub-sections dealing with repair and renewals of parts are primarily directed towards ensuring that no alteration shall be made to the electrical characteristics.

Attention is drawn in the covering circular (No. 117) to the importance of ensuring that the legibility of identification plates on certified apparatus is maintained, and that all appara-

tus covered by this Order is so constructed, installed and used as to prevent danger, and thoroughly examined periodically by a competent electrician who shall record the results. The voltage must not exceed 25 V in any one circuit, and precautions must be taken to prevent signal and telephone wires from touching cables and other apparatus.

Firedamp Detection

General Regulations relating to firedamp detectors are being circulated in draft by the Mines Department (M.D. Cir. No. 119). These will, with one exception, come into force on April 1st, 1939, subject to the decision of a referee regarding objections on specific points made before January 2nd. They require the use of approved appliances for detecting inflammable gas in every seam in which safety lamps are required at the working face. One detector must be provided for every eight men on each face of long-wall workings and at their specified places and in conjunction with each electric motor within 100 yd. of the working face. Other sections deal with the appointment of competent men to take charge of the detectors and conditions of their use.

The above draft Regulations are based on the unanimous recommendations of the Committee on the Firedamp Detector Regulations. The more difficult Regulation (No. 3), which is concerned with the compulsory provision, in certain circumstances, of automatic detectors in safety-lamp seams, follows the recommendation of the majority of the Committee. This section would not come into operation before September next. It provides that the detector required for each electric motor and one detector in eight at any long-wall face when electric power is being used shall be of automatic type, subject to specified variations and exemptions.

Parliamentary News

(BY OUR SPECIAL REPORTER)

Electrical Apparatus in Mines

IN the House of Commons on December 6th Mr. Ellis Smith asked the Secretary for Mines if he would consider issuing a regulation that no cast-iron should be used in the manufacture of apparatus for use in mines; and that all designs, and a specimen of apparatus to be manufactured for use in mines, should be approved in the first place by the Safety in Mines Research Station, Buxton.

Captain Crookshank said that cast-iron had many proper uses in mining apparatus and the general prohibition of its use would not be justified. The suitability of the materials used in the construction of flameproof electrical apparatus was one of the matters dealt with in the examination and tests which governed the official certification of such apparatus, and exception was taken to the use of cast-iron or any other material for purposes for which it was considered to be unsuitable.

Mr. Smith further asked if the Secretary had considered the need to have all apparatus intended for use in mines to be made flameproof and that the designs and methods of testing by manufacturers must be approved by the Safety in Mines Research Department, Buxton.

Captain Crookshank said that official testing and certification of flameproof electrical apparatus and electrical signalling apparatus had been carried out on a voluntary basis for some years past. General regulations had recently been made requiring that all electrical signalling apparatus for use in seams in which safety lamps were required to be used must be of types so certified. The question of requiring that other electrical apparatus should in similar circumstances be of certified flameproof design was one of the matters which had been submitted to the Royal Commission and would be considered in the light of any recommendations which it might make on the subject.

High Electricity Charges

On December 7th Mr. Robert Gibson asked the Minister of Transport if he would state the name of the local authority in England and Wales charging 9d. per kWh for electricity for lighting; the names of the four other statutory undertakers in England and Wales charging 10d.; and the local authority and the two other statutory undertakers in Scotland who charged 10d. per kWh.

Mr. Burgin said that the undertakings were (a) Dolgelley Urban District Council; (b) the companies supplying electricity in Aberayron, Borth, Chudleigh and Woodstock; (c) the Tobermory Town Council, and (d) the companies supplying electricity in Beauly and Stornoway.

East London Railway Electrification

On December 12th Mr. McEntee asked the Minister of Transport whether, in view of the progress that had been made with the electrification of the East London railways where work was proceeding, he could now give favourable consideration to the electrification of the Liverpool Street-Chingford line.

Mr. Burgin said that this was a matter primarily for the consideration of the undertakings concerned. He was informed that until further progress had been made with the programme of railway improvements at present being carried out in the London Passenger Transport Area, at a cost of some £40,000,000, it was not possible for the undertakers to envisage the scope of the next programme of works to be undertaken. Transport facilities in the London Area were, however, being examined and the priority determined of works to be considered when the present programme was completed.

Supply for Farms

Sir Irving Albery asked the Minister of Agriculture if his Department was taking any steps to ascertain whether an adequate electrical supply was being made available to farmers for agricultural purposes; and whether he was taking any steps, in conjunction with the Minister of Transport, in this matter.

Mr. W. S. Morrison said he was keeping in close touch with the Minister of Transport in this matter, and if his hon. friend had in mind any particular area where there were any special difficulties or lack of supply he was sure that the Minister would gladly have inquiries made.

Beam Wireless

Mr. Rathbone asked the Postmaster-General upon what date the Post Office beam stations would, in accordance with the Imperial Telegraphs Act, 1938, be transferred to Cable and Wireless, Limited; how many and which of these stations would thereupon be closed down; and what arrangements were being made for alternative employment for those now working at these stations.

Major Tryon said that under the deed of conveyance which was on the point of being completed the transfer of these stations would take effect as from March 1st, 1938. He was informed by the company that, as at present arranged, the installations at Bodmin, Bridgwater and Grimsby would in due course be transferred to existing stations at Dorchester, Somerton and Ongar respectively. He was assured by the company that all members of the staff affected would be transferred to stations operated by the company with the exception of certain unestablished labourers. In these cases he was informed that long notice and adequate compensation would be given.

French Supply for Spain

Sir Nairne Stewart Sandeman asked the Prime Minister whether he was aware that the nationalised railways electric power station of La Tour de Carol in France was making plans to supply Government Spain with its surplus output of 30,000 kW to enable the Puigcerda-Barcelona railway line to function normally and the unrequired balance to be used for driving factories, &c.; and whether, as this was a breach of the Non-Intervention Agreement, he would make representations about the matter.

Mr. Butler said he was aware of this, but he was advised that assistance of this kind would not constitute a breach of the agreement. The answer to the last part of the question was therefore in the negative.

In the Courts

Charge Against Colliery Officials

RESPONDENTS in the prosecution against A. G. Moore and Co. and three of their officials at No. 3 Pit, Blantyreferme Colliery, Newton, Lanarkshire (which we reported in our last issue), are to ask for a stated case, with a view to appeal, with regard to the Sheriff's decision after a four-day trial on charges relating to the Coal Mines Regulations. His Lordship, it will be recalled, acquitted the company but imposed penalties on the manager of the pit, the chief electrician, and the assistant electrician.

Hailé Selassie's Claim

The Court of Appeal, consisting of the Master of the Rolls and Lords Justices Scott and Clauson, on December 6th, decided the case of Hailé Selassie (the ex-Emperor of Abyssinia) against Cable & Wireless, Ltd., the litigation arising over an agreement for a radio service between Addis Ababa and Great Britain. The claim, which was to recover from the Cable & Wireless Co. £10,613, originally came before Mr. Justice Bennett in the Chancery Division, who decided that he had no jurisdiction in the matter. The Court of Appeal afterwards decided that there was no rule of law that deprived Hailé Selassie of his right to claim in the English Courts and sent the case back to Mr. Justice Bennett who gave judgment for Hailé Selassie with costs. Then an appeal from that result was opened in the Court of Appeal, and since then the British Government's *de jure* recognition of the King of Italy as ruler of Abyssinia had become a fact. The company had stated that it was ready to pay whoever was entitled to the money.

On December 6th at the resumed hearing of the appeal the Master of the Rolls stated that in the circumstances the late Emperor's title to the public property of Abyssinia no longer existed, and the result was that the right to sue must be treated as having become vested in the King of Italy and, therefore, the appeal of the Cable and Wireless Co. must be allowed.

Personal and Social

Information regarding new appointments and other matters of interest for this page are welcomed

Mr. Thomas Mensforth, B.Sc., A.M.I.E.E., who was recently appointed managing director of the Hotpoint Electric Appliance Co., Ltd., has had an unusually varied experience since his early training at the City and Guilds College in 1920-23. After a period as apprentice and junior engineer with the Metropolitan Vickers Electrical Co., Ltd., Manchester, he joined Bolckow, Vaughan & Co. as technical assistant, subsequently becoming assistant works engineer and electrical engineer to the Cleveland Iron and Steel Works of that company. In his next appointment, as works manager to the Darlington Rolling Mills Co., Mr. Mensforth was responsible for the design and erection, as well as for the operation, of a modern factory for rolling steel window sections. Following this, he served Dorman, Long & Co., of Middlesbrough, as electrical engineer, and later as chief engineer, relinquishing this latter position in June, 1933, to take up an appointment with Edmundsons Electricity Corporation, Ltd., where he acted as director on the boards of various subsidiary companies. Mr. Mensforth's first connection with Associated Electrical Industries, Ltd., dates from 1937, when he joined the staff of Edison Swan Cables, Ltd.

Mr. C. Morgan Davies, A.M.I.E.E., who has reviewed the Radiological Exhibition for the ELECTRICAL REVIEW for the past five years, practises as consulting engineer specialising in the design and construction of X-ray installations and other special electrical equipment peculiar to hospitals. He served his apprenticeship with Mr. H. H. Arthur, M.I.E.E., then engineer and manager of Carmarthen Electric Supply Co., and afterwards received mechanical training with Browett Lindley & Co., Ltd., Manchester. During the war he served in the R.A.F., and upon demobilisation completed his technical education at the Borough and Battersea Polytechnics. For some time he served as lecturer at the Borough Polytechnic, and has also lectured extensively to radiographic students. For many years he was a senior member of the engineering staff at King's College Hospital, where he acquired special knowledge of hospital usage and medical requirements. He is a member of the British X-ray Protection Committee, an associate of the Hospital Officers' Association, a member of the British Institute of Radiology, and consulting radiological engineer to a number of hospitals, including the Middlesex Hospital, King's College Hospital, Westminster Hospital, National Hospital, and Leeds General Infirmary.

[Lafayette
Mr. C. Morgan Davies

It is announced that two of the chief officers of the Brighton Tramways are to retire. Both have served the Corporation for many years. **Mr. W. Marsh,** who has been the engineer and manager of the tramway undertaking since May, 1905, retires as from April 30th next year and the Committee has placed on record its appreciation of his long and faithful service, and has granted him leave of absence from a convenient date in December. He will be deemed to be in active service up to the date of his retirement and will act as consultant during the intervening period. The other retiring officer is **Mr. F. N. Hudson,** deputy engineer and manager. He has been with the Corporation for over forty years, and the Committee has also recorded its appreciation of his services.

Mr. Louis J. Hunt, M.Inst. C.E., M.I.E.E., sales manager of the Electric Construction Co., Ltd., has been appointed to a seat on the board of that company.

Over 200 members of the British Thomson-Houston Co.'s Willesden organisation, with visitors representing the constituent companies of A.E.I., Ltd., assembled on December 9th at the Café Royal, where the theme of the evening was "In Town To-night," a model of a portion of Piccadilly Circus, complete with Eros and flower girls, being erected in the reception room. **Mr. G. E. Riley** (manager, switchgear sales) was in the chair. Mr. T. Hands (B.T.-H. Willesden manager), in proposing the toast of "Associated Electrical Industries, Ltd.," pointed out that it was now entering its second decade, and it could not be said that the policy pursued by A.E.I. of retaining separate identities and preserving a spirit of healthy competition, with close co-operation in research and manufacture, could be anything but beneficial to both the customer and the employé. Sir Felix Pole (chairman and managing director, A.E.I., Ltd.), in reply stated that so far from employment being reduced, it had been increased. Regarding future tendencies, he again struck a definitely optimistic note. It was not necessary, he said, to expect war to be lurking round each corner, and be prophesied at least two further years of good business. "The Visitors" was proposed by Mr. H. E. Cox (engineering department superintendent) and replied to by Mr. G. M. Campbell (director, B.T.-H. Co.). Mr. J. L. Wilson (director, B.T.-H. Co.) proposed "The chairman," to which Mr. Riley responded.

Leeds Corporation Electricity Committee has recommended the appointment of **Mr. E. Porter,** chief assistant engineer, as executive officer of the Electricity Department pending the making of an appointment to fill the vacancy caused by the death of Mr. C. N. Hefford, the general manager and city electrical engineer.

Mr. A. W. Saulter has been appointed to the board of directors of Clough (Croydon), Ltd. He retains his position as general manager.

The annual dance and cabaret of Central London Electricity, Ltd., was held at Derry & Toms' Restaurant on December 9th, when over 1,000 members of the staff and their friends attended.

Mr. B. Sleath has been appointed sales manager and **Mr. J. Selley** and **Mr. H. G. Towner,** joint assistant sales managers for Venner Time Switches, Ltd. **Mr. K. A. Taylor,** of the technical staff, will be leaving this month for an extensive tour of South Africa in the company's interests and **Mr. A. E. Worby** has joined the inside sales organisation.

Mr. J. Hepburn, director and secretary of the J.P. Tubular Heater Co., Ltd., Newarthill, Lanarkshire, has been appointed commercial manager of Davidson & Co., Ltd., Sirocco Works, Belfast. Mr. Hepburn was responsible for the secretarial work at the inception of British National Electrics, Ltd., J.P. Tubular Heater Co., Ltd., British Weaver Manufacturing Co., Ltd., and Irish Electrics, Ltd.

We are pleased to learn that **Mr. H. L. Guy,** chief engineer of the Mechanical Engineering Department of the Metropolitan-Vickers Electrical Co., Ltd., has been elected to the Council of the Royal Society. Mr. Guy was elected a fellow in 1936, and he is a member of the Engineering Sciences Sectional Committee. Early this year he was elected a vice-president of the Institution of Mechanical Engineers.

Mr. N. F. Marsh, M.A., A.M.I.E.E., has been appointed acting manager of the Mid-Lincolnshire Electric Supply Co., Ltd., Mr. L. Giacomuzzi, M.I.E.E., the late managing director, having resigned from that position owing to ill health.

Mr. W. R. T. Willis, who since 1932 has been actively connected with the Lamp Sales Section of Crompton Parkinson, Ltd., and since 1936 has held the position as manager, London Sales, has resigned his position with that company in order to take up the position of London sales manager with Ensign Lamps, Ltd.

Mr. W. C. Lusk, chairman and managing director of the British Thomson-Houston Co., Ltd., sailed for the United States last week.

At the Westminster Palace Rooms, London, recently, over 300 guests attended the third annual J. & P. London Office dance, organised by Mr. J. Johnson Smith and his staff at Aldwych, W.C.2. The duties of M.C. were carried out jointly by Messrs. J. T. Sanders and Mr. H. D. Parsons. The gathering was fully representative of the industry and J. & P. engineers from all parts of the country attended. Gordon Marsh's cabaret gave an excellent show. Mr. G. L. Wates (chairman) and Mr. C. Stewart attended from the J. & P. board, and Mr. P. V. Brittlebank (general sales manager) and Mrs. Brittlebank were also present.

At the J. & P. dance. (left to right): Messrs. P. V. Brittlebank (general sales manager), G. R. Lincoln (Ringmer and District Electricity Co., Ltd.), J. A. Wilmshurst (Portsmouth), and J. Johnson Smith (London)

Mr. H. H. Jones, a director of Walter Jones & Co. (Engineers), Ltd., asks us to state that he is not the author of "A.C. Motors of Fractional Horse Power," which was reviewed in our last issue.

Obituary

Mr. C. I. Shuttleworth.—We regret to announce the death of Mr. Charles Irwin Shuttleworth, A.M.I.E.E., chief engineer of the Hull Corporation electricity undertaking, which occurred on December 6th at the age of fifty-nine. Mr. Shuttleworth was an articled apprentice with a Leeds engineering works, from which he went to Barrow-in-Furness as an improver. He joined the Hull undertaking in 1900 as charge engineer and served in various capacities until his appointment as deputy engineer in 1928. He was acting engineer for three months before Mr. J. N. Waite went to Hull. Mr. Shuttleworth was appointed chief engineer of the Hull undertaking in April this year and at the same time Mr. D. Bellamy was appointed general manager.

The late Mr. C. I. Shuttleworth

Sir Tom Callender.—The funeral of Sir Thomas Octavius Callender took place at Erith Cemetery on December 8th. The burial was preceded by a service in Erith Parish Church at which the Rev. R. W. Thornhill officiated, assisted by the Rev. D. Taylor. The family mourners included Mr. and Mrs. T. O. Callender (son and daughter-in-law), Miss L. M. Callender (sister), Mrs. J. O. Callender (sister-in-law). Callender's Cable and Construction Co., Ltd., was represented by Sir Fortescue Flannery (chairman), Major-General Sir Frederick Sykes, Sir Malcolm Fraser, Mr. P. V. Hunter, and Mrs. C. Pipkin. Others present included the Earl of Verulam, Sir Montague Hughman and other representatives of electrical organisations.

A choral memorial service was held at St. Clement Danes, Strand, W.C.2, on December 9th, the Rector, the Rev. W. Pennington-Bickford, officiating. The lesson was read by Mr. H. Foulds, secretary of Callender's. There was a large congregation and among those present were :—

Mr. W. F. Bishop, Mr. G. Balfour, Mr. J. R. Beard, Mr. E. G. Baker, Mr. E. J. Bolton, Sid Edward Crowe, Sir J. Fortescue Flannery, Sir Malcolm Fraser, Mr. R. T. G. French, Mr. J. Gray, Mr. F. Gill, Mr. G. M. Gabell, Sir Montague Hughman, Mr. R. R. Hyde, Miss C. Haslett, Mr. E. C. Holroyde, Mr. F. Harries, Mr. J. F. W. Hooper, Mr. J. S. Highfield, Mr. W. G. Hendrey, Mr. W. C. C. Hawtayne, Mr. P. V. Hunter, Mr. F. C. Harris, Mr. W. Hawthorne, Mr. R. Horne, Mr. A. H. M. Jacob, Mr. G. H. Jackson, Mr. P. Kelly, Mr. W. C. Lusk, Mr. W. Lewis-Smith, Lord Meston, Lt.-Col. S. E. Monkhouse, Mr. W. McClelland, Mr. W. McGill, Mr. J. S. McCallum, Mr. E. M. Malek, Mr. W. Murray Morrison, Mr. W. A. Pearman, Mrs. Theodore Petersen, Mr. C. Pipkin and Mrs. Pipkin, Mr. F. Parkinson, Mr. R. B. Paul, Sir Leonard Pearce, Sir Alexander Roger, Mr. J. H. Roberts, Mr. P. F. Rowell, Mr. H. T. Rice, Sir Maurice Simpson, Mr. J. N. Stephens, Major-Gen. Sir Frederick Sykes and Lady Sykes, Mr. W. Shearer, Mr. W. J. Terry, Mr. C. D. Taite, Mr. E. A. Walsh, Mr. V. Watlington, Mr. J. L. Wilson and many members of the staff of Callender's Cable & Construction Co., Ltd.

In our obituary notice last week we stated that Sir Tom was the last survivor of those present at the dinner to mark the foundation of the Cable Makers' Association. Mr. J. E. Kingsbury informs us that he attended that dinner as general manager of the Western Electric Co. (now Standard Telephones & Cables, Ltd.), and that for a period he acted as chairman of the Association in its early years.

Mr. R. W. Weightman, whose death we announced in our last issue, was trained in the British Post Office, and in about 1894 joined the Post and Telegraph Department in Natal, where he became chief engineer. He retired from this post when the Natal service was amalgamated with others and formed into a single department under the Union Government. Early in 1912 he returned to England and joined the staff of Preece, Cardew & Snell (now Preece, Cardew & Rider), since when he had dealt with the telegraph, telephone and radio developments of the various British Colonies. He became a partner in the firm in 1924. In recent years he had been closely associated with the provision of automatic telephone exchanges of the central office and rural types in Ceylon, Malaya, Kenya, Uganda and Tanganyika, Palestine, Iraq and the Bahamas, and with the "All-Island" telephone schemes in Jamaica and Mauritius. He had also been associated with the broadcasting stations in Hong Kong and Jerusalem, and in the radio equipment for the airports in Kenya, Uganda, Tanganyika, N. Rhodesia, on the South African air route, and Nigeria and Gold Coast on the West African air route, and Palestine, Iraq, Malaya, and Hong Kong on the Far-East air route. He was a member of committees of the British Standards Institution, dealing with telegraph and telephone materials. Mr. Weightman became a member of the I.E.E. in 1896.

The late Mr. R. W. Weightman

Mr. H. W. Albrow.—We regret to record the death of Mr. H. W. Albrow, who for many years was the Sheffield branch manager for Siemens Electric Lamps & Supplies, Ltd.

Chinese Electrical Imports

THE Chinese Maritime Customs have recently issued the import trade returns for 1937, in spite of the inconveniences to which their work has been subjected. In view of recent happenings one cannot help wondering whether they will be issuing further returns under the same administration.

The following statistics relating to the electrical trade in 1937 have been extracted, and increases or decreases compared with 1936 are noted. It is surprising to find that so much trade was still being carried on last year. The part taken by Japan was notable. Values are given in gold units, worth in sterling 32¼d. in the years under review.

	1937. Gold units (000)	Inc. or dec. on 1936. Gold units (000)
Dynamos and generators—		
Total	185	− 5
From Germany	68	− 40
„ United Kingdom	26	− 10
„ United States	28	+ 14
„ Japan	40	+ 33
Electric motors and parts—		
Total	843	+ 55
From Belgium	21	+ 5
„ Germany	227	+ 19
„ United Kingdom	144	+ 36
„ Japan	310	− 45
„ Sweden	52	+ 25
„ United States	52	+ 21
Transformers—		
Total	344	+ 10
From Germany	174	+ 37
„ United Kingdom	38	− 19
„ Japan	95	+ 23
„ United States	8	− 39
Electrical machinery, unspecified—		
Total	685	− 232
From Germany	225	− 78
„ United Kingdom	223	− 49
„ France	5	− 5
„ Japan	124	− 50
„ United States	78	+ 6
Electric lamps and lampware—		
Total	296	− 365
From Germany	78	− 372
„ United Kingdom	63	+ 57
„ United States	94	− 35
„ Japan	36	+ 3
Electric fans and accessories—		
Total	29	− 18
From United Kingdom	8	—
„ United States	3	− 11
„ Japan	15	− 2
Flashlights and torch-cases—		
Total	65	+ 17
From Hong Kong	42	+ 8
„ United States	19	+ 7
„ Japan	1	—
Radio sets and parts—		
Total	1,568	− 323
From Germany	72	− 130
„ United Kingdom	357	+ 103
„ Japan	140	− 151
„ Holland	120	+ 68
„ United States	867	− 210
Other telegraph and telephone instruments and materials—		
Total	1,107	− 34
From Belgium	175	+ 80
„ Germany	665	+ 41
„ United Kingdom	58	− 91
„ United States	49	− 54
„ Japan	48	+ 14
Electric bulbs—		
Total	77	+ 7
From Germany	8	—
„ Japan	40	+ 4
„ Holland	6	+ 1
„ United States	13	+ 2
Accumulators and cells—		
Total	408	+ 83
From Germany	50	+ 1
„ United Kingdom	26	− 9
„ Hong Kong	35	+ 9
„ Japan	35	+ 4
„ United States	252	+ 81
Electric meters and parts—		
Total	571	+ 56
From Germany	250	+ 14
„ Switzerland	93	+ 20
„ United Kingdom	20	− 4
From United States	115	+ 30
„ Japan	55	− 3
Electrical appliances, unspecified—		
Total	430	+ 167
From Germany	38	+ 7
„ United Kingdom	40	+ 32
„ Japan	21	+ 1
„ United States	331	+ 113
Electric cables—		
Total	1,064	+ 384
From Germany	478	+ 232
„ United Kingdom	202	− 3
„ Japan	242	+ 67
Insulated wire—		
Total	1,447	+ 260
From Germany	313	− 54
„ United Kingdom	198	+ 155
„ Japan	570	− 12
„ United States	135	+ 37
Insulators, fuse-boxes, plugs, switchboards, etc.—		
Total	173	+ 9
From United Kingdom	32	+ 13
„ Japan	78	− 8
„ Germany	37	− 3
Switches—		
Total	44	− 1
From Japan	16	—
Electric condensers and parts—		
Total	19	− 9
From United States	9	− 7
Other electrical fittings and materials, unspecified—		
Total	771	− 211
From Germany	145	+ 47
„ United Kingdom	93	− 402
„ Japan	271	+ 39
„ United States	207	+ 81

Commercial and Industrial News

Short-circuit Testing Association. Electricity in Agriculture. Sign Factory Extension. Loan Redemption Periods. Tool Manufacture. Export Credit Guarantees

Our Christmas Arrangements

OWING to the Christmas Holidays classified advertisements for our issue of December 30th must be received not later than Friday, December 23rd.

Short-circuit Testing

Following the announcement in our issue of October 21st that the Department of Scientific and Industrial Research had completed arrangements with owners of short-circuit testing stations for testing certain ranges of switchgear under conditions which will permit the issue of National Physical Laboratory certificates, the Association of Short-Circuit Testing Authorities was registered on December 7th as a company limited by guarantee, without share capital. Each member is liable for £1 in the event of winding up. The word "Limited" is omitted from the title by licence of the Board of Trade. The objects are to establish, maintain and conduct an organisation for co-ordinating the short-circuit testing of switchgear equipments, circuit-breakers, power fuses and transformers, reactors, separate current transformers and any other electrical apparatus capable of such tests, to issue certificates under the seal of the Association on the results of the tests; to co-operate with electrical manufacturers, technical associations, the Department of Scientific and Industrial Research and others, to promote research, &c. The management is vested in a Council, the first members of which are as follows:—Ferguson, Pailin, Ltd., and Switchgear Testing Co., Ltd., represented by Mr. S. Ferguson; British Short-Circuit Testing Station, Ltd., represented by Mr. B. H. Leeson; A. Reyrolle & Co., Ltd., represented by Mr. L. E. Mold; English Electric Co., Ltd., represented by Mr. G. H. Nelson; General Electric Co., Ltd., represented by Dr. A. H. Railing; Metropolitan-Vickers Electrical Co., Ltd., represented by Mr. P. S. Turner; and British Thomson-Houston Co., Ltd., represented by Mr. J. L. Wilson. The registered office of the Association is at 36, Kingsway, London, W.C.2.

London Transport Wage Increase

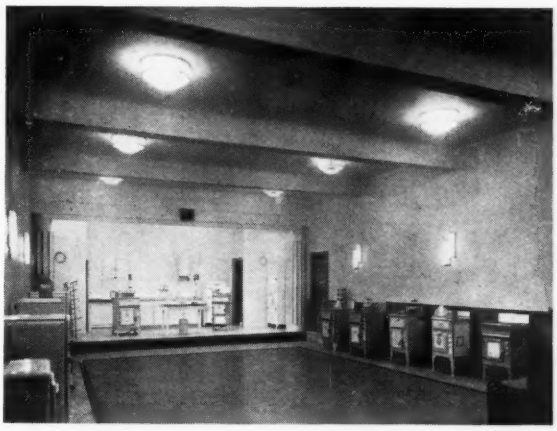
The London tram and trolley-bus drivers and conductors have agreed to accept an offer made by the London Passenger Transport Board to raise their wages by 2s. a week, the increase to operate at once. The men had asked for 4s.

A C.M.A. Booklet

The Cable Makers' Association has published a booklet in which it describes its origin in 1899 and its activities during the past thirty-nine years. Attention is directed to the benefits secured by cable users as a result of the research and development of technique which the Association has fostered and to which the pre-eminence of British cables in the world markets can be attributed. Emphasis is laid upon the subject of standardisation and the Association says:—"Internally the C.M.A. has done everything possible to ensure reasonable uniformity in cable production, but co-operation from consumers has not been all that could have been desired. The C.M.A. therefore introduced its new selling terms for mains cables in order, if possible, to stimulate the interest of consumers in the necessity for standardisation of this class of cable. Not less important than standardisation as a means of reducing costs, however, is the vital necessity of continuity of work and a reasonable distribution of output. It is impossible to run a factory economically if there are constant violent fluctuations in the amount of work being dealt with, and it was for this reason that the C.M.A. decided to introduce a rebate for those customers who assisted in maintaining an even flow of production by consistently placing their orders with the members of the Association. Such continuity of work is not only an encouragement to the Association in the furtherance of its aims for the successful progress of the industry as a whole, but also a very definite practical help, and as such is reciprocated by the C.M.A. in the form of a rebate, which is simply a payment for services rendered."

The South-East London Showrooms

In our issue of November 18th we described the new Lewisham showrooms of the South Metropolitan Electric Light and Power Co., Ltd. The accompanying photograph which we have received from Holophane, Ltd., shows the interior of the showrooms. The lighting scheme for the demonstration



Holophane lighting fittings in the Lewisham showrooms of the South Metropolitan Electric Light & Power Co., Ltd.

room was prepared by the company and special fittings were designed on lines of modern close ceiling units. Holophane "Steplite" fittings are used in conjunction with a large circular diffusing glass surround fitted on to the ceiling. The side wall brackets are a special stepped design of Holophane "Pagoda" units. In addition to these a special scheme of Holophane blended lighting is used in the showrooms.

Electricity in Agriculture

At a meeting of the Council of Agriculture for England held at the Middlesex Guildhall, London, last week, one of the reports considered was that of the Standing Committee on the Application of Electricity in Agriculture. Motion by private members included one from Ald. W. B. Pinching, A.M.I.E.E., to the effect that the Council was of opinion that a cheap and abundant supply of electricity was an urgent need for the welfare of agriculture. It was agreed that these proposals were basically the same as those contained in the standing committee's report. It was reckoned that there were upwards of 150,000 of the larger farms in England and Wales still unsupplied with electricity as well as a number of small villages. The Committee understood that as a general rule the supply authorities were prepared to deal with individual farms which required the construction of a special line on the basis of an initial cash contribution and an annual guaranteed revenue, and was of the opinion that it would certainly assist if a statement of minimum requirements and customary

Two Christmas displays showing (left) the Edison Swan Electric Co.'s window in Charing Cross Road, and (right) a G.E.C. display at its headquarters in Kingsway

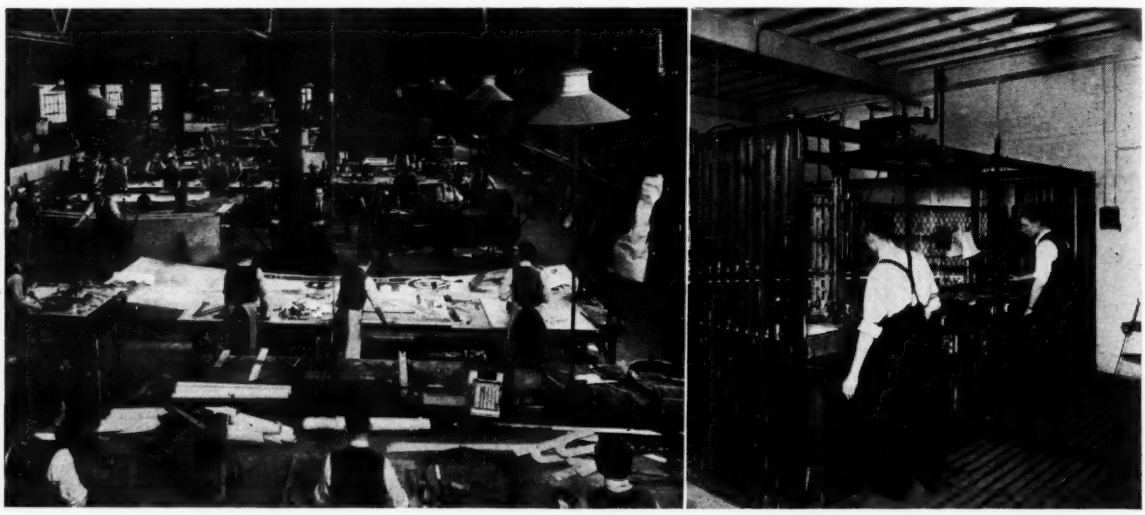
variations could be issued in plain terms for the assistance of the rural dweller in making his decision. The British Electrical and Allied Industries Research Association had proposed that one of its Committees should consider from the technical point of view all possible means of reducing the cost of giving service to isolated farms; and the possibility of raising the amount of electrical "loads" on farms and in country districts in the interests of consumers.

Some county Rural Community Councils had assisted farmers by giving them information as to available supplies and probable costs, by summing up their requirements, and representing them to the local supply authorities. Excellent results had been achieved in the counties of Derby and Nottingham, and those counties were considerably in advance of most other rural areas in England in matters of electricity supply. The standing committee stated that it was prepared to continue its inquiries, and to report to the Council on other aspects such as the circumstances and progress made in the provision of lighting and power in individual sections of the industry, *e.g.*, dairying, horticulture, poultry keeping, and even in large scale arable farming.

Electric Sign Factory Extension

Recent extensions to the factory of the Franco-British Electrical Co., Ltd., at Colindale, N.W., adding approximately one-third to the previous floor area, give the company a further justification for its claim to be the world's largest general sign manufacturer and have permitted a comprehensive rearrangement and extension of practically every department. One of the most important sections, the designing department, on whose coloured sketches so much of the new business depends, now employs a staff of sixteen, while a separate new single-storey building has been erected for the production of the full-sized drawings from which every sign, whether neon, box, wood, reflex, traffic or other type, is built up. All the information required for the making of the sign is contained in these drawings, copies of which go to the glass, wood and metal workers and the blacksmiths.

Neon tube manufacture has also been moved to a new section of the factory where every process from the tube bending to the making of the electrodes, exhausting and filling is carried out. Special activity is noticeable at present in connection with the production of fluorescent tubes and a large stock of both these and standard units are to be seen in a gallery where the tubes are finished off and stored preparatory to dispatch. The blacksmiths', metal workers' and carpenters' shops have all been extended considerably since we visited the works two or three years ago and, though they are equipped with up-to-date machinery wherever possible, the nature of the work still renders mass-production impracticable for most processes, reliance having to be placed largely on the craftsmanship of individual workers. All the transformers required for the neon signs are made on the premises, about twenty different types in capacities from 3.5 to 14 kVA giving 30 to 60 mA being produced. Each one is tested to about 25 per cent. overload.



A portion of the extended factory of the Franco-British Electrical Co., Ltd., with (right) the neon tube exhausting bays

South African Electricity Supply Commission

Particulars of the Electricity Supply Commission were filed on December 2nd, pursuant to Section 344 of the Companies Act, 1929. The company was incorporated in South Africa under the Electricity Act, 1922. The British address is 535-546, Adelphi, W.C.2, where Mr. G. A. Jenkin is authorised to accept service of process and notices on behalf of the company. The directors are: J. van der Bijl, 17, Rose Road, Upper Houghton, Johannesburg (chairman of South African Iron and Steel Industrial Corporation Ltd., and African Metals Corporation, Ltd.), A. M. Jacobs, 78, Valley Road, Park Town, Johannesburg (member and chief engineer of the Electricity Supply Commission), R. B. Waterston, 133, Malan Street, Riviera, Pretoria (member of Control Road Transport Board of South Africa), and W. P. M. Henderson, 219, Southridge Road, Durban.

Cooking Demonstrations at Birmingham

On December 15th and 16th Moffats, Ltd., are staging a large cookery demonstration and variety show at the Midland Institute, Birmingham. Miss Elizabeth Craig will be in charge of the demonstrations and several well-known artists will assist with the programme. There are three sessions, on the first day at 2.30 and 7.30 p.m., and on the second at 2.30 only.

The Hire Purchase Act Explained

The United Dominions Trust, Ltd., has issued a booklet entitled "The Hire Purchase Act, 1938," in which it has arranged in convenient form an explanation of the provisions of the Act. The Act itself is also printed, while forms of the cash price and hire-purchase agreements are reproduced.

Cooker and Meter Loan Periods

The December *I.M.E.A. Journal* says that for some time past the Council of the Association has considered the desirability of having the loan redemption period extended for certain apparatus and to that end appointed representatives to attend a conference recently called by the Electricity Commissioners. In fixing the loan redemption period the Commissioners, of course, have to bear in mind the fact that such periods should be well within the physical life of the asset.

Evidence was submitted to show that vitreous enamel cookers, providing an efficient service department was maintained, should last for at least ten years and that the average life of meters is at least twenty years. It was difficult to obtain figures with regard to water heaters and wash boilers, as ten years ago the amount of such apparatus on hire was relatively small, so that conclusive evidence of its average life was not available. The Commissioners have promised to give the matter their consideration.

E.D.A. Activities

In connection with its Refrigeration Campaign E.D.A. organised a special sales contest in July and awarded gold, silver, bronze and enamel badges to salesmen and saleswomen who, during that period, effected sales of not fewer than twenty, twelve, eight and four cabinets respectively. The Association has now issued a list of those to whom these medals have been awarded. This shows that fifteen qualified for the gold medal, eighteen for the silver medal, twenty-two for the bronze medal and seventy-five for the enamel medal.

Under the Association's salesmanship training scheme 1,639 students have enrolled for the course since the commencement in April, 1937, and of these 863 have passed the final examination and gained the E.D.A. Domestic Electrical Salesmanship Certificate, while 150 sat for the final examination at the end of November. The number of E.D.A. Domestic Electrical Salesmanship Diplomas which have been granted to date is 287, and twenty-seven Sales Engineers' Diplomas have been awarded.

The Association, in collaboration with E.L.M.A., held a Public Lighting Conference at Halifax on December 14th, at which more than 100 delegates in the West Riding of Yorksire attended.

E.I.B.A. Branches

At the first meeting of the new Northamptonshire and District Committee of the Electrical Industries Benevolent Association Mr. E. G. Byng, a director of the General Electric Co., Ltd., was appointed chairman, and Mr. F. J. Tillson and Mr. W. Austin, both of the Northampton Electric Light and Power Co., Ltd., were respectively appointed honorary secretary and honorary treasurer. This is the seventh committee to be launched in the last six weeks, the others being:—Berk-

shire and Buckinghamshire (Mr. J. W. Arthur, M.I.E.E., Reading Corporation, chairman, Mr. W. H. Tranmer, honorary secretary); Essex (Mr G. F. Gregory, M.I.E.E., borough electrical engineer, Ilford, chairman, Mr. H. King, honorary secretary); Grimsby and North-East Lincolnshire (Mr. R. S. Windle, M.I.E.E., borough electrical engineer, Grimsby, chairman, Mr. J. Magee, honorary secretary); Suffolk (Mr. C. H. Steele, Callender's Cable and Construction Co., chairman, Mr. W. H. Howell, honorary secretary); Hampshire, Dorset and District (Mr. Lyster Holt, honorary secretary); and Edinburgh (Mr. James Stobo, honorary secretary).

Key Industry Duty

The Board of Trade has received an application under Section 5 (5) of the Finance Act, 1936, for a licence to import free of duty a resistance measuring unit measuring resistances in the neighbourhood of 50,000 ohms to an accuracy of approximately 3 per cent., comprising mains rectifying equipment, ohmmeter and standard resistances. Any representations that similar apparatus is made, or is likely to be made within a reasonable time, in the United Kingdom or elsewhere in the dominions, should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, within one month from December 7th, furnishing details of such similar apparatus, and quoting reference I.M.3953/38.

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted:—

H. Worth, Pudsey, Leeds; L. Nicholson & Co., Ltd., Milford-on-Sea; Shelley Bros., Southend-on-Sea; F. Hancock, Fenton, Stoke-on-Trent.

At the same meeting one application was declined.

Charlton Greyhound Stadium

With reference to the illustration of the Charlton Greyhound Stadium which appeared on page 830 of our December 9th issue, Venreco, Ltd., informs us that it designed and manufactured the fittings in which "Philora" lamps were used for illuminating the stadium.

Christmas Holidays

Laurence, Scott & Electromotors, Ltd., announce that their works will be closed from December 24th until January 3rd.

Electric Tool Manufacture

So rapid has been the growth of the business of Grimston Electric Tools, Ltd., since it began manufacturing about twelve years ago that it has outgrown its factory accommodation four times. The latest move has been into new works in Progress Way, Purley Way, Croydon, where a large modern single-floor factory has been erected, and in view of previous experiences arrangements have been made for ample extensions at the rear. The range of manufactures includes double-ended bench and pedestal grinders, precision tool post grinders, electric drills (both single and multi-purpose types), flexible shaft machines, sanders, polishers, blowers and portable sheet metal shears. The management has aimed at making the works as self-contained as possible. All machine work is done on the premises, and a considerable quantity of high-speed modern machinery has been installed. While standard small tools such as milling cutters, reamers and counter-bores are used as far as possible, all the jigs, gauges and special tools are made in a tool room laid down for this purpose. The manufacture of the electrical side of the machines is of a high standard. Armatures are hand wound and vacuum impregnated, while vacuum impregnating plant and the necessary pre-heating and drying ovens are all electrically heated and thermostatically controlled. Mr. T. W. Wilks, the manager, informed us that all portable tools are subjected to an eight-hour running test, and are flash tested when the motors are still warm. All high-speed armatures are dynamically and statically balanced, a process which adds somewhat to the cost of manufacture, but which has been found to be amply justified by results. In order to cater for machines of the various voltages and types of current met with not only in this country but abroad a comprehensive test bench is being installed, providing any DC, or single-, two- or three-phase AC voltage. The DC supply is provided by a Nevelin mercury arc rectifier.

A Hotpoint Demonstration Kitchen

The Hotpoint Electric Appliance Co., Ltd., has opened a new department at its Newman Street showrooms for the dual purpose of giving adequate practical demonstrations of its larger apparatus, cookers, washers, &c., and opportunity for prospective demonstrators who have qualified in domestic science elsewhere to perfect themselves in the practical use of major appliances before taking up posts with supply authorities. A basement has been transformed into a spacious, well-lighted department in two sections, one for demonstrating cookers of all types and the Hotpoint dishwasher and the other for the clothes washer, and its corollary the new pressure ironer. Here customers can see this apparatus in ordinary normal use and learn how to handle the various lines, and both demonstrators and customers can acquire a more intimate practical experience than is obtainable in an ordinary showroom.

The Hotpoint demonstration kitchen at its Newman Street showrooms

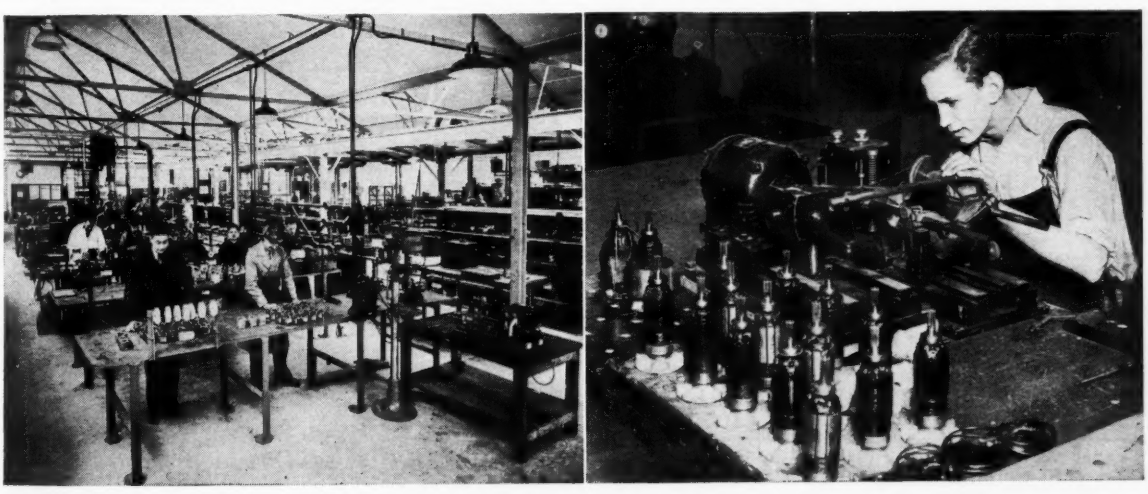
Trade Announcements

The General Electric Co., Ltd., has opened two new stores depôts, one in Londonderry, Northern Ireland, and the other in Bradford. The address of the Londonderry depôt is 12, Foyle Street, and Mr. W. A. McClay has been placed in charge. The Bradford depôt is mainly for the distribution of "Osram" lamps, and is at 109, Thornton Road. It is under the supervision of Mr. W. H. Cliff.

From January 2nd the Manchester office of Earle, Bourne & Co., Ltd., will be Sunlight House (5th floor), Quay Street, Manchester.

B.E.N. Patents, Ltd., are moving their offices and works early in the New Year to Hughenden Avenue, High Wycombe, Bucks. (Telephone: High Wycombe 1630. Telegrams: "Tooinwun, High Wycombe.")

The Union Lamp & Lighting Co., Ltd., informs us that Potter, Cowan & Co., Ltd., have been appointed factors for Union architectural lamps in Scotland and will be holding stocks. Their three branches in Scotland are 21-27, Pitt Street, Glasgow; 30, North West Thistle Street Lane, Edinburgh; and 33, North Lindsay Street, Dundee. Displays of these



The assembly shop at the new works of Grimston Electric Tools, Ltd. and (right) a dynamic balancing machine for high-speed armatures *[Elec. Rev. photo.*

lamps will be shown in their Edinburgh and Glasgow showrooms.

Export Credit Guarantees

Last week the President of the Board of Trade introduced a Bill providing that the maximum amount which the Board may guarantee under the Export Guarantees Act, 1937, shall be raised from £50 to £75 millions. In addition the Department will be empowered to undertake liabilities up to an amount of £10 millions in respect of guarantees which might not be considered as ordinary commercial risks. Since the export credits scheme was instituted transactions to the extent of £180 millions have been guaranteed by the Department and the total of claims plus administration expenses have been more than covered by the premiums received.

A Street Lighting Guide

An illustrated booklet of over seventy pages has been issued by the British Thomson-Houston Co., Ltd., under the title of "Planned Street Lighting," as a guide to correct practice. Details are given of the "Mercra" range of discharge lamps and of the lanterns that have been specially designed for illuminating main roads, less busy traffic routes, and roads in rural areas where low cost and ease of maintenance are essential. The lanterns include the "County Junior," which is suitable for either "Mercra" or "Mazda" lamps for use in side streets. The "Sodra" (sodium-vapour) lamps are also described. The response of fluorescent material to ultra-violet radiation is discussed and its application as a colour-corrective in the new "Mercra" fluorescent lamp where colour values are of importance. Many pages deal with accessories, such as chokes and condensers, transformers (for use with "Sodra" lamps), control boxes with fittings, lighting standards, brackets and raising and lowering gear. A description is included of the B.T.H. photo-electric relays and their action in street-lighting control, of the foot-candle meter for testing, and finally a couple of pages are given to illuminated traffic signs and guard posts conforming to Ministry of Transport requirements. Illustrations of representative installation occupy eleven pages.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price December 14th.	Fortnight's inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax... ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3½d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4¼d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£199	£18 inc.
Grade II ... ... ,,	£139	£12 inc.
Grade III ... ... ,,	£75	£5 inc.
c Brass (rolled metal 2″ to 12″ basis)... per lb.	8¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	11½d. to 11¾d.	½d. dec.
c ,, Wire, basis ... ... ,,	8¾d.	—
c Copper Tubes (solid srawn) ... ,,	1/0½d.	½d. dec.
g ,, Bars (best selected) ... per ton	£80	—
g ,, Sheet ... ... ,,		—
g ,, Rod ... ... ,,		—
d ,, (Electrolytic) Bars ... ,,	£49 10s.	—
d ,, ,, Wire Rods ... ,,	£54 5s.	—
d ,, ,, H.C. Wire ... per lb.	7⅛d.	—
f Ebonite Rod ¼″ dia. & up. ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛″ thick & up ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12 .. ,,	2/4	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Para-fine ... ... ,,	7½d.	½d. dec.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1 P.O. Qual. ... ,,	£23	—
g Lead, English Pig ... ... ,,	£16 15s.	£1 5s. dec.
g Mercury ... ... per bot.	£14 15s.	5s. dec.
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/1d.	—
p ,, ,, rolled strip & sheet ,,	11½d.	½d. dec.
p ,, ,, wire ... ... ,,	1/1½d.	½d. dec.
o Platinum ... ... per oz.	£7 10s.	—
d Silicum Bronze Wire ... ... per lb.	8½d.	—
g Spelter ... ... per ton	£13 11s. 3d.	2s. 6d. dec.
g Tin, Block (English) ... ... ,,	£214 5s.	5s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

Heating Appliance Publicity

Premier Electric Heaters, Ltd., has prepared a number of displays and showcards which form part of its sales campaign for its domestic electric heating appliances. Two examples of its showcards are illustrated in the accompanying picture.

Two attractive showcards which are being supplied to retailers by Premier Electric Heaters, Ltd.

These displays and showcards have been installed in numerous showrooms throughout the country. One of the small displays in particular has proved very popular. It is fitted with a clever device which gives a realistic representation of rising smoke and flame. In addition to its display material the company has produced a number of catalogues covering its entire range of electric heating appliances.

New Catalogues and Lists

Sun Electrical Co., Ltd., 118-120, Charing Cross Road, London, W.C.2.—An 86-page catalogue giving revised prices for the "Sunco" general catalogue, No. 700, issued in 1936.

Dorman & Smith, Ltd., Ordsal Electrical Works, Salford, Manchester, 5.—Leaflet No. L.130, dealing with "Ordsal" high rupturing capacity cartridge fuses.

Watson & Sons (Electro-Medical), Ltd., Sunic House, Parker Street, Kingsway, London, W.C.2.—Details of the "Autonome II" motor-driven couch and "Röntgen IV" high-voltage generator.

G. Turnock, Ltd., 41, High Street, Aston, Birmingham, 6. —A leaflet describing lampholders, a ceiling rose, and b.c. adaptor.

British Insulated Cables, Ltd., Prescot.—A leaflet dealing with "Bulldog" tape and jointing materials.

Manganese Bronze & Brass Co., Ltd., Handford Works, Ipswich.—A 32-page book describing the advantages of "Oilite" self-lubricating bearings.

Aidas Electric, Ltd., Sadia Works, Rowdell Road, Northolt, Middlesex.—The "Sadia" water-heating catalogue, one of the first to contain technical installation data, has just been issued in improved and enlarged form with an attractive coloured cover.

Walker Bros., Quality House, Temple Row, Birmingham, 2. —A folder illustrating suitable electrical Christmas gifts.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds, 2. A quarterly stock list of new and second-hand electrical materials.

H. Morris, Ltd., Loughborough.—A 64-page booklet dealing with industrial equipment such as hoists, telphers, pulleys, etc.

Bankruptcy Proceedings

S. Herzberg, trading as S. Herzberg & Co., electrical dealer, 11, Victoria Dock Road, Canning Town.—The first meeting of creditors was held on December 6th at London Bankruptcy Buildings, the receiving order having been made on November 22nd upon the petition of creditors. The debtor states that he came to England from Germany four years ago and has traded as above during the last two years. He estimates his liabilities at £2,000 against assets valued at £640, and attributes his insolvency to inability to carry out contracts owing to the liquidation of the company which supplied him with goods. Mr. H. Green was appointed trustee of the estate.

R. A. Bowles, radio dealer, 2, Sefton Road, Litherland, Liverpool.—Receiving order made December 1st on a creditor's petition. First meeting December 16th and public examination January 10th, both at Government Buildings, Victoria Street, Liverpool.

J. T. Wyer, electrician and radio dealer (East Coast Electrical Services), 34, Hilderthorpe Road, Bridlington.—Receiving order made December 5th on debtor's own petition.

T. J. Mathews (Universal Radio), radio dealer, 40, Rumbridge Street, Totton, Hants.—Application for discharge to be heard on January 17th at the Court House, Southampton.

F. E. Walton, electrical engineer, Island Hotel, Eel Pie Island, Twickenham.—Trustee, Mr. J. L. Poland, 29, Russell Square, London, W.C.1, Official Receiver, released November 21st.

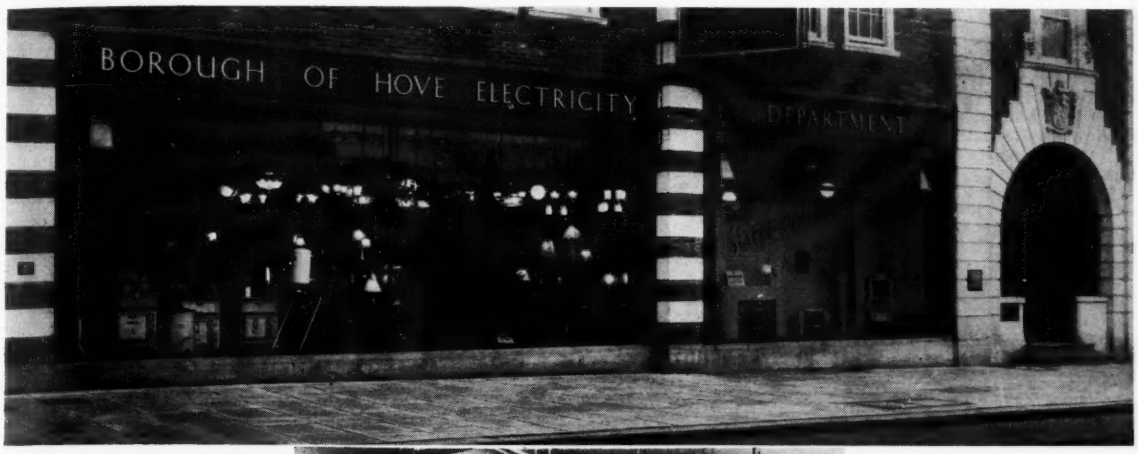
G. W. Linsell, radio and electrical engineer, Tippendale Lane, Park Street, near St. Albans, lately carrying on business at 26, London Road, St. Albans.—Trustee, Mr. F. E. Bendall, 4, Charterhouse Square, London, E.C.1, released November 25th.

(Concluded at foot of next page)

New Showrooms at Hove

ON Friday last the new showrooms of the Hove Corporation Electricity Department at Hove Street were formally opened by Sir Cyril Hurcomb (chairman of the Electricity Commission).

Alderman W. H. Payne (chairman of the Electricity Committee), in introducing Sir Cyril, reviewed the progress of the undertaking since it was acquired by the Corporation in 1914, and mentioned that to-day there were over 18,000 consumers and the sales totalled 23,000,000 kWh at an average cost per kWh of 1.4d. The charges were amongst the lowest in the country, the "unit" charge under the domestic tariff being ½d. in the winter and ¼d. in the summer. Nearly all the street lamps in the borough had been converted to electric lighting. He referred to the good work carried out by the local circle of electrical contractors and the local branch of the E.A.W. The new showrooms had cost £9,000, which had been paid for out of surplus revenue.



The exterior of the new showrooms of the Hove Corporation Electricity Department and the counter in the main showroom

In declaring the showrooms open Sir Cyril Hurcomb said that the Hove undertaking was in a stage of transition. More than half of the consumers were still supplied on the DC system at 220 V while those on AC were supplied at either 220 or 230 V. At the end of 1937-38 roughly half of the total number of undertakings in this country were still giving part or whole of their supplies on DC systems, and there were 293 undertakings using non-standard voltages for the whole or part of their supplies. The Electricity Commissioners had decided to examine how the problem of standardisation could best be tackled, so as to remove a source of inconvenience, loss and legitimate irritation to consumers. He suggested that the Hove electricity undertaking should work out a plan for complete standardisation at 230 V at a reasonably early date. In congratulating the Electricity Committee and Mr. F. Swarbrick, borough electrical engineer, on the successful progress of the undertaking, he said that its domestic consumption had increased at a satisfactory rate, and in the last three years it had risen by 48 per cent., while the kWh sold per domestic consumer had increased by 27 per cent. Out of a total of 17,500 domestic premises consumers connected numbered nearly 16,000. There was, however, much room for further development in the domestic field, and this could be promoted by the new showrooms.

The new showrooms have been built on a site occupied by smaller showrooms, and the opportunity has been taken to centralise the administrative and office staff. The ground floor has a spacious showroom, tastefully decorated, with large display windows.

Here there is a well arranged display of domestic appliances and lighting fittings. Special features are the stands in the showrooms, which are divided in the centre and wired from the inside. These can be stood in various parts of the room and windows, and fed from floor plugs. On the panelling around the room there are shields to which fittings are attached. These shields can be detached from the panelling so that the panelling itself will not be damaged by constantly changing fittings. On the floor above there is a demonstration hall with a platform where periodically cooking and other demonstrations will be given. At the rear of this are the new offices for the electrical engineer and his staff. The electrical installation of the new premises has been carried out by Messrs. Galliers, of Brighton.

(Continued from previous page)

Bankruptcy Proceedings

N. K. B. Jones, radio dealer, Pendarren, Granville Street, Shrewsbury, lately carrying on business at St. Julian's Friars, Shrewsbury.—Receiving order made November 30th on a creditor's petition. First meeting December 20th at 22, Swan Hill, Shrewsbury. Public examination January 18th at the Shire Hall, Shrewsbury.

F. G. T. Lane, radio dealer, 101, Crouch Street, Colchester.—Last day for receiving proofs for dividend December 24th. Trustee, Mr. K. E. Fisk, 13a, Great Colman Street, Ipswich, Official Receiver.

A. Robson, radio engineer (Anson Radio), 147, Dickinson Road, Rusholme, Manchester.—Last day for receiving proofs for dividend December 24th. Trustee, Mr. F. H. Langmaid, Byrom Street, Manchester, Senior Official Receiver.

S. A. Smith (S.S. Radio), radio engineer, 23, Broad Street, Launceston.—First and final dividend of 1s. 5d. in the £, payable December 17th at 11, St. Aubyn Street, Devonport, Plymouth.

Company Liquidations

John Lewis (Wireless), Ltd.—Meetings December 29th at 5, Royal Terrace, Weymouth, to receive an account of the winding-up by the liquidator, Mr. F. A. Perigo.

Standard Radio Relay Services, Ltd.—Meeting January 10th, at Bush House, Aldwych, London, W.C.2, to receive an account of the winding-up by the liquidator, Mr. W. C. Thornton Cran.

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 7th.

Brytallium. No. 534065. Class 5 (III). Metal in ingots, &c.—The Brytallium Metal Co., Ltd., 26, Brazennose Street, Manchester.

Crypton (lettering and design), No. 586948. Class 8 (III). Electrical and mechanical apparatus and instruments for testing internal combustion and compression ignition engines, battery testing and charging apparatus, and electric current rectifying apparatus.—Crypton Equipment, Ltd., North Acton Road, Park Royal, N.W.10.

Permendur. No. 601175. Class 6 (8). Magnetic alloys, being alloys of non-precious metals.—Standard Telephones and Cables, Ltd., Connaught House, 63, Aldwych, W.C.2.

Monitor. No. 600996. Class 9 (IV). Electric switches, not being parts of alarms or alarm systems, actuated by clockwork or motor-driven timers, or by light-sensitive cells or by electromagnetic appliances, for use in lighting, heating and power systems.—The Horstmann Gear Co., Ltd., 58, Newbridge Road, Bath.

Sigtay. No. 601180. Class 11 (IV). Ordinary electric lamps.—La Société Lampes et Entreprises Electriques, Ninove, Belgium (British representatives: Cope & Co., 65, Victoria Street, Westminster, S.W.1).

Electricity Supply

Lighting, Domestic, Power

Alloa.—NEW POWER STATION.—On December 6th Mr. H. Mitchell, M.P., inaugurated a new power-generating and coal-washing plant at the Devon colliery of the Alloa Coal Co., Ltd. The new plant, costing £30,000, supplies power to the company's five collieries and also to its Meta brick works. The power plant consists of a turbo-generator of the mixed pressure type rated at 1,875 kW supplied by Belliss & Morcom, Ltd., and Mather & Platt, Ltd., and the switchboard by R. M. Russell. The speed of the turbine is 3,000 RPM, which is reduced to 1,000 RPM for the generator. Power is generated at 600 V and is transmitted to the various collieries at 6,000 V. A feature is that 600 kW is obtained during the winding shift from exhaust steam. Existing boiler plant had to be completely reconditioned, and the boilers now have a working pressure of 150 lb. The steam is superheated by plant supplied by Ferguson Superheaters, Ltd. Senior economisers raise the temperature of the feed water to 300 deg. F. A forced draught fan has been used in conjunction with Heywood furnaces so that low-grade fuel can be burned. A cooling tower has been erected by the Premier Cooling Tower Co. The complete system of steel piping from the boilers to the generating plants and winding engines has been installed by Messrs. Munro & Miller. There is also a standby plant for emergency purposes and, in addition, a steam turbine pump delivering 2,200 gal. per min. Simon-Carves designed the new washery. It consists of an automatic Baum type box, with a capacity of 150 tons per hr. Large coal can be reduced to the desired size by a Hadfield three-stage crusher and then taken to the washery. The steel construction work has been carried out by Messrs. McLeod, Alloa, and Mr. Robert Beatson has been responsible for the erection of the buildings.

Barnard Castle.—RURAL SUPPLIES.—The North-Eastern Electric Supply Co., Ltd., has informed the Rural District Council that it is considering affording an electricity supply to Lynesack and Softley, Bowes Close, Ramshaw, Lands, Hamsterley and Woodland.

Brighton.—LARGE LOAN.—The Electricity Committee has decided to apply for consent to borrow a further £100,000 for future requirements for mains and house services.

Cardiff.—DEVELOPMENT PLANS.—To cope with the increased load a number of schemes for installing additional plant in sub-stations were recently decided upon by the Electricity Committee, and new sub-stations are to be erected at Splott Park (£1,606) and Greek Church Street (£1,459). An expenditure of £4,110 has been authorised in connection with the provision of a supply to a new factory at Dumballs Road.

Chichester.—EXTENSIONS.—Schemes contained in the plan for electricity supply which has been approved are:—Extra high-voltage mains extension, £1,000; low-voltage mains extensions, £11,434; services, £21,000; switchgear, £13,880; meters, £5,875; apparatus for hire, £29,000; and showrooms and offices, £10,000.

Cheltenham.—AIR RAID PRECAUTIONS.—The Electricity Committee has approved an air raid precautions scheme costing £5,187.

Chesterfield.—BETTER LIGHTING.—The Lighting Committee recommends that the lighting of the trunk road should be improved by metal filament lamps at an estimated cost of £5,137.

Colchester.—Subject to certain conditions, the Town Council is to extend its low-voltage distribution to Peldon Rose and Mersea Road, Peldon, at an estimated cost of £358.

Consett.—ELECTRIC LIGHTING.—The Ministry of Health has approved the Urban District Council's plan for the installation of electric lighting in 765 houses.

Easington.—SUPPLY TO CRIMDON PARK.—The Rural District Council has sealed an agreement with the North-Eastern Electric Supply Co., Ltd., for a supply of electricity to Crimdon Park.

East Ham.—WATER HEATERS IN SCHOOLS.—The twelve water heaters installed experimentally at the Cornwell School are reported to have proved very satisfactory.

Fifeshire.—ELECTRICITY IN COUNCIL HOUSES.—The tenants of Burntisland Council houses are to be permitted to install electric lighting at their own expense, provided the installation is carried out to the satisfaction of the Council.

Gravesend.—LOAN FOR EQUIPMENT.—The Electricity Committee is seeking sanction to borrow £1,052 for transformers and switchgear and £10,000 for meters.

Gt. Yarmouth.—SUPPLY EXTENSION.—Consent has been obtained to supply premises known as Marsh Mill in the parish of Horning.

LOANS.—Additional mains and services are required to meet the demand for electricity and application is to be made for a loan of £10,000. In addition, permission is being sought to borrow £25,000 for domestic appliances, £5,000 for sub-station equipment and £2,000 for house wiring.

Hebden Royd.—COMMERCIAL COOKING TARIFF.—The Electricity Department is to adopt a new commercial cooking rate of ¾d. per kWh as from January 1st.

Hereford.—SUPPLY TO TUPSLEY CROSS.—The Corporation has agreed to the supply of electricity to the Tupsley Cross estate by overhead and underground cables.

METER TESTING.—The Shropshire, Worcestershire and Staffordshire Electric Power Co. is to erect a meter-testing room in Widemarsh Street.

Kettering.—STREET LIGHTING.—The Town Council has decided to erect electric lamp standards and fittings on the Westfield building estate, Kettering, providing payment is made in advance by those responsible for the development of the estate.

LIBRARY LIGHTING.—Consideration is to be given early next year to the provision of improved lighting in the library buildings at Kettering.

LOAN.—Application is to be made to the Electricity Commissioners for sanction to a loan of £65,000 for unspecified mains and services.

Laurencekirk.—STREET LIGHTING.—The Town Council is to hold a special meeting to consider the advisability of adopting electricity for street lighting in the burgh. Several offers for the installation have been received, the estimated cost being £225.

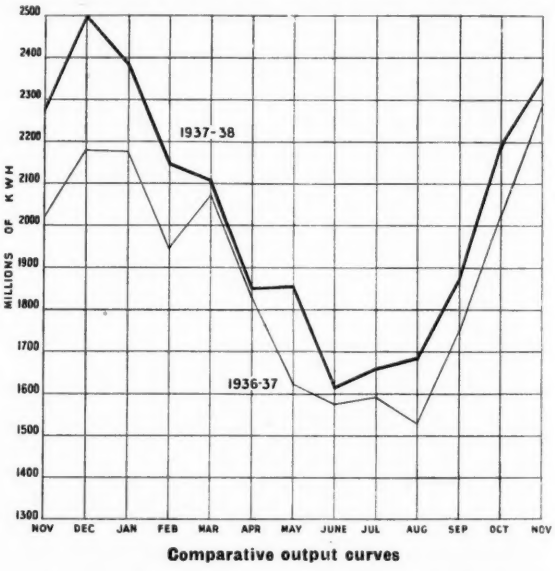
Leeds.—LOANS.—Sanction is being sought by the Electricity Committee to borrow £720,000 for the extension of Kirkstall generation station. It is also applying for permission to borrow £80,000 for services.

Liverpool.—LOWER CHARGES.—Reduced charges for electricity supplies in Liverpool and the surrounding districts have been approved by the Corporation. The new flat rate for power, including heating, is 1½d. per kWh for the first 1,000 kWh, 1¼d. for the next 1,000 kWh, 1d. for the next 8,000 kWh and dropping to 0.9d. for still larger consumptions. Concessions are also made in the all-purposes tariff for business and private premises. In regard to the prepayment meter scale, the fixed charge in respect of Corporation owned houses is reduced from 1s. 2d. to 1s. per week. The Electric Power and Lighting Committee also proposes to reduce the hire charges for electric cookers retained at one address for a period exceeding three years and the hire charge for electric wash boilers where there is an electric cooker at the same address.

London.—SOUTHWARK.—ASSISTED WIRING.—The Electricity Committee is to carry out assisted wiring at an estimated cost of £1,145.

Generation of Electricity in November

OFFICIAL returns rendered to the Electricity Commissioners show that 2,346 million kWh was generated by authorised undertakings in Great Britain during November, as compared with the revised figure of 2,285 million kWh in the corresponding month of 1937, representing an increase of 61 million kWh, or 2.7 per cent. The number of working days



Comparative output curves

in the month (*i.e.*, excluding Sundays) was twenty-six, the same as last year. The weather was abnormally mild during the month.

During the eleven months of 1938 up to the end of November the total amount of electricity generated by authorised undertakings was 21,701 million kWh, as compared with the revised figure of 20,405 million kWh for the corresponding period of 1937, representing an increase of 1,296 million kWh, or 6.4 per cent.

Macclesfield.—SALE OF UNDERTAKING.—The Electricity Co. of Macclesfield, Ltd., has informed Macclesfield Corporation that it is prepared to enter into negotiations for the sale of the part of the undertaking which the Corporation wishes to acquire.

Maidenhead.—CHANGE-OVER.—The electrical engineer has

New lighting along the Dublin-Dalkey traffic route

been authorised to lay new mains in connection with the change-over to AC.

Manchester.—REDUCED HIRE CHARGES.—On January 1st lower charges will come into operation for the hire of cookers and water heaters. The reductions are from 6d. to 1s. per quarter on cookers, according to type (not from 2s. to 2s. 6d. as stated in our issue of December 2nd), and from 6d. to 3s. 6d. per quarter on water heaters.

Portsmouth.—SUPPLY EXTENSION.—The Electricity Committee is to furnish a supply to Compton, Forestside and West Marden at a cost of £6,515.

Salisbury.—ELECTRIC DISCHARGE LIGHTING.—The City Council has decided to light the main streets of the city with sodium vapour discharge lamps. The whole of the city is at present lighted by gas. The city's present lighting rate is 3.88d., and the improvement will add another 1½d.

Sheffield.—BLACKBURN MEADOWS EXTENSION.—The Finance Committee has approved the expenditure of £35,000 on additions to buildings and foundations at the Blackburn Meadows generating station.

Stanhope (Co. Durham).—LIGHTING PLANS DEFERRED.—Owing to the high costs of certain materials the Parish Council has deferred certain plans for electric street lighting extensions.

Startforth (Yorkshire).—SUPPLY TO OVINGTON.—The Rural District Council has decided not to oppose the plans of the North-Eastern Electric Supply Co., Ltd., for the supply of electricity to Ovington.

Swansea.—AIR RAID PRECAUTIONS.—The borough electrical engineer's £3,000 air-raid protection scheme has been deferred pending an interview with the Electricity Commissioners and the Central Electricity Board.

Tynemouth.—PROPOSED LEGISLATION.—The Town Council is to promote a Bill in Parliament which, among things, will give the Corporation further powers regarding its electricity undertaking, including the compulsory acquisition of lands for substations, and wayleaves, &c.

Uxbridge.—TRANSFER OF PURCHASE RIGHTS.—A public inquiry was opened by the Electricity Commissioners on Monday into a proposal to transfer to the London and Home Counties Joint Electricity Authority the purchase rights of local authorities having jurisdiction in the area of supply under the Uxbridge and District Electricity Supply Orders, 1900 and 1906, as amended by the North Metropolitan Electric Power Supply Act, 1937, and for the representation of the local authorities on the J.E.A. The objectors included the Uxbridge and District Electricity Supply Co., the Metropolitan Electric Supply Co., the London Power Co., and the Ealing and Willesden Town Councils. Mr. J. Chuter Ede, M.P., chairman of the J.E.A., said that owing to development in the area the number of local authorities concerned in the purchase rights had increased from six to thirteen. On Tuesday Mr. H. F. Bidder spoke on behalf of local authorities who supported the proposal, while for the Ealing and Willesden Town Councils Mr. M. FitzGerald, K.C., claimed that it would be a gross injustice to take away the purchase rights that Ealing wanted to exercise and to pass them on to another authority.

Workington.—LOANS.—The Electricity Committee is seeking sanction to borrow £6,500 for mains and services; £3,000 for the assisted wiring scheme and £2,500 for mains.

ELECTRICITY FOR COUNCIL HOUSES.—It is recommended that the houses to be erected on the Westfield estate should be lighted by electricity.

Walton-le-Dale.—SODIUM LIGHTING.—After considering an estimate of the Lancashire Electric Power Co. for providing and installing sodium lighting on trunk roads A6 and A49 in the district for £3,146, the Council has decided that the work shall be carried out, provided a 50 per cent. grant towards the capital cost and maintenance cost is guaranteed by the Ministry of Transport.

Overseas

Eire.—ROAD LIGHTING.—A new lighting installation has recently been completed along eight miles of the main traffic route from Dublin to Dalkey by the Public Lighting Section of the E.S.B. under the direction of Mr. F. X. Algar. Existing tram standards have been used for the brackets, which project 6 ft. towards the centre of the road. The lanterns are fixed at an average height of 25 ft. 6 in. above road level, opposite each other. The average distance between each pair is 121 ft. Each lantern is fitted with a 300-W filament lamp. The contract was carried out for the Dublin and Dun Laoghaire Corporations. The installation has made the public so "light conscious" that there is now a big agitation for further development on similar lines.

India.—BIHAR RURAL ELECTRIFICATION SCHEME.—A committee of experts, under the chairmanship of Sir M. Visvesarayya, is considering the report of the special officer in charge of the Bihar rural electrification scheme.

Western Australia.—ELECTRICAL PROGRESS.—The report of the Government Electricity Supply Department for the year ended June 30th last shows an increase in earnings of £27,282 to £390,344. Working expenses also increased from £267,277 to £286,821, leaving a net surplus of £31,810, an increase of £6,909 over the previous year. Over half of the total output was taken by the City of Perth Electricity Department, the total amount sold reaching 108.6 million kWh, as compared with

The new "B" station at East Perth, Western Australia

100.6 million kWh in 1937, an increase of 8 per cent. There is considerable shortage of plant, but it is hoped that a new station at East Perth will be in operation at the end of this year.

Traction

Brighton.—TROLLEY-BUS EQUIPMENT.—The electrical engineer has been authorised to proceed with the purchase of the necessary cables and adaptation of the existing cables and other work in connection with the operation of trolley-buses.

Glasgow.—INQUIRY.—An inquiry is to be held by the Transport Committee regarding the report which was recently presented by the management advising against the suggested adoption of an experimental service of trolley-buses in the city.

RAILWAY ELECTRIFICATION.—The electrification of the Cathcart Circle Railway, other suburban railways, and the lines to the Ayrshire coast resorts is among the proposals contained in a memorandum submitted by Lord Provost Dollan to the Unemployment Committee of Glasgow Corporation.

Great Britain.—ELECTRIC VEHICLES.—The number of electric vehicles in use is stated to have been 1,526 in 1934, 1,836 in 1935 and 3,751 in July, 1938. The number of vehicles registered for the first time was 632 in 1935, 819 in 1936 and 911 in 1937.

Southern Railway.—WATERLOO AND CITY LINE IMPROVEMENTS.—In connection with the improvements which are being carried out on the Waterloo and City Railway tenders have been received for the complete renewal of the rolling stock. Increased accommodation will be provided in the new trains, which will be fitted with power-operated doors. Other new

equipment includes signals, cables, switchgear and conductor rails.

Sweden.—TRAFFIC CONTROL IN STOCKHOLM.—An alternative method by which traffic lights can be regulated by passing vehicles is at present being installed in Stockholm. The system, constructed by the L. M. Ericsson Co., is based on the utilisation of the changes which the iron in passing vehicles occasions in the electro-magnetic field of "impulse spools" buried under the road surface. The sensitivity of these spools is such that they can be affected not only by motor cars, horse-drawn vehicles and motor-cycles, but also by cycles and hand-carts if desired. Traffic signals of this kind are considered especially suitable at crossings between a smaller side-street and a main street with priority for heavy traffic. The Ericsson system has also been adapted with success as an automatic traffic counter which registers every vehicle passing within the sphere of sensitivity of the impulse spools, and it can be made to drive a reel of paper upon which it draws columns proportionate in size to the intensity of the traffic during a given period.

Communications

China.—CONTROL OF TELEPHONE SYSTEM.—The Japanese-controlled Central China Tele-Communications Co., of Shanghai, is arranging to take over the operation of the telephone administration of Soochow.

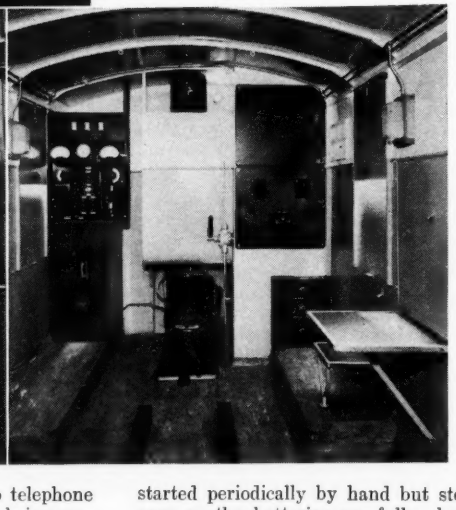
Federated Malay States.—NEW RADIO STATION.—According to a report from Singapore, a new radio station is to be constructed in Pahang, one of the Federated Malay States, to provide communication with ships and aircraft and for inter-Malayan communication.

Great Britain.—RADIO RELAYS.—An announcement of policy by the Government in connection with the future of radio relays in this country is considered imminent. The Radio Manufacturers' Association makes out a strong case against Government ownership of radio relays in a recently issued booklet, contending that ownership and management of such services should remain in private hands. The National Association of Radio Retailers fully supports the R.M.A. policy, but the Wireless Retailers' Association has issued an official statement condemning both Government and privately owned relays. The Electrical Contractors' Association (Inc.) is to collaborate with the R.M.A. in the campaign against Government ownership.

EXTENSION OF BROADCASTING HOUSE.—Work on the construction of the extension to Broadcasting House, which will more than double its size, will be begun next summer, and is expected to be completed by the end of 1940. The site area at ground-floor level is 20,950 sq. ft., compared with the present 17,390 sq. ft., and the building will go down to 54 ft. below pavement level, lower than the vaults of the Bank of England. There will be five underground studios, each in a separate shell floated and isolated from the building itself. A general purposes studio will be 80 ft. long, 54 ft. wide, and 30 ft. high. Three dramatic studios, an "effects" studio, and a number of rehearsal rooms will also be provided. A control room suite will be situated on the seventh floor, and this will be in addition to the present control room.

A Mobile Telephone Exchange

TWO years ago the G.P.O. introduced a travelling post office that can be driven by road to agricultural shows and similar outdoor events, so providing facilities for the public transaction "on the spot" of all kinds of postal business, including the dispatch of telegrams. Two telephone booths are incorporated in this van, trailing cables being employed for the purpose of making the necessary temporary connection to the nearby Post Office overhead or cable network.



Views of the new mobile automatic telephone exchange. The Postmaster-General is seen telephoning at the inaugural ceremony. With him is Sir George Lee, engineer-in-chief of the G.P.O.

Development of this idea has resulted in a somewhat similarly contrived mobile automatic telephone exchange, the first of its kind being inaugurated by the Postmaster-General last week prior to its being brought into service for the first time at North Weald in Essex. The van has been designed by Post Office engineers for such emergency uses as restoration of telephone service in the event of an existing exchange being put out of action by fire or some other calamity; or in an urgent case in which unavoidable delay has occurred in completing a new village exchange.

For such purposes the solid looking green trailer vehicle, which is weatherproof, can be parked in a yard beside the road. Trailing cables provide temporary connections between the telephone cable network and van, which accommodates standard Post Office automatic exchange units, made by Standard Telephones & Cables, Ltd., to enable 90 subscribers to dial their local calls directly to one another and also to dial trunk operators at a neighbouring exchange for the completion of longer distance calls.

The loaded weight of the trailer is six tons and a tractor tows it wherever its services may be most needed. The chassis, with torsion bar suspension, was supplied by J. Brockhouse & Co., Ltd., of West Bromwich, and the bodywork by E. G. Brown & Co., of Tottenham. It has double sheet-steel walls, roof and floor, the space between being filled with heat-insulating material to prevent interior condensation of water vapour.

This new exchange on wheels is quite self-contained, generating its own electricity for lighting (Holophane) and for battery charging when AC mains are not available.

Even the rain water that falls on the roof of the van is collected and drained automatically into a storage tank from which it can be pumped into the cooling radiator of the Petter petrol engine of 2 HP which drives a generator furnishing a DC output of 10 A at 60 V for battery charging. This set is started periodically by hand but stops itself automatically so soon as the batteries are fully charged. Alternatively, the batteries can be charged by means of a Tungar rectifier from public supply mains.

Duplicate "D.P." lead-acid batteries are installed of the traction type with a capacity of 72 Ah each at 50 V, and each is capable of energising the telephone switching equipment for a week without attention. Apart from weekly visits for inspecting the mechanism and starting the recharging of the batteries this mobile exchange will work unattended.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Heating, Ventilation and Air Conditioning Exhibition Co., Ltd.—Private company. Registered December 8th. Capital, £100. Objects: To carry on the business of promoters, organisers and managers of any show or exhibition in connection with trade, industry, art or science, to establish and carry on exhibition halls and galleries, &c. The directors are: C. W. Glover, 5, Overstrand Mansions, S.W.11, D. Algar, 10, Swyncombe Avenue, Ealing, W.5, and V. A. Kraminsky, 18, Gloucester Place, Portman Square, W.1. Registered office: Shell Mex House, Strand, W.C.2.

James Johnston (Electrical), Ltd.—Private company. Registered in Belfast December 1st. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in all kinds of electrical supplies, apparatus and plant &c. The subscribers are: J. Johnston and J. A. Johnston, both of 23, College Street, Belfast. Registered office: 23, College Street, Belfast.

Immersion Heaters, Ltd.—Private company. Registered December 8th. Capital, £200. Objects: To carry on business as manufacturers and salesmen of immersion heaters, sterilisers or general hospital equipment, &c. The subscribers are: P. V. Gilmore, 36, Thornton Road, Washwood Heath, Birmingham, and J. N. T. Ogley, 34, Manor Road, Streetley, Staffs. Secretary: H. Graham Doody. Registered office: 47, Newhall Street, Birmingham, 1.

John McNicol & Co. (Electrical Engineers), Ltd.—Private company. Registered in Edinburgh December 6th. Capital, £6,000. Objects: To carry on the business of electrical engineers, dynamo and motor manufacturers, manufacturers of electrical switchboards and gear, &c. The directors are: J. M. McNicol and J. Weir, both of 116, Clyde-Ferry Street, Glasgow, C.3, and E. J. McNicol, 36, Walter Street, Dennistoun, Glasgow, E.1. Registered office: 116, Clyde-Ferry Street, Glasgow, C.3.

Sterilectric, Ltd.—Private company. Registered December 7th. Capital, £500. Objects: To carry on the business of sellers of air conditioning and sterilising plant, electrical equipment, &c. D. Rose, 56, Cranleigh Gardens, Kenton, Harrow, is the first director.

W. Gregory & Son, Ltd.—Private company. Registered December 7th. Capital, £6,000. Objects: To acquire the business of an electrical contractor, heating engineer, &c., now carried on by G. E. Gregory at 11-12, Bailgate, Lincoln, as W. Gregory & Son. The permanent directors are: Geo. E. Gregory (chairman and managing director), Nethergate, Nettlesham Road, Lincoln, and Geo. R. Gregory, 20, Longdale Road, Lincoln. Secretary: Geo. R. Gregory.

Roto Shaver Corporation, Ltd.—Private company. Registered December 7th. Capital, £2,100. Objects: To carry on the business of merchants and manufacturers of and dealers in electric dry shavers, &c. The directors are: H. Bolsom, 31, Christopher Street, E.C., S. J. Gilbey, 1, Bentinck Close, N.W.8, and A. Mountain, 22, Dudley Court, Marble Arch, W.2. Secretary: H. Rose. Registered office: 32, London Wall, E.C.2.

Dyno-Mag, Limited.—Private company. Registered in Dublin November 29th. Capital, £1,000. Objects: To carry on the business of manufacturers of dynamos, magnetos, batteries, electric starters, &c. The subscribers are: J. Pearce, 35, Pearse Street, Dublin, M. Gerard Plunkett, 1, Church Avenue, Drumcondra, Dublin, and M. King, 18, Nassau Street, Dublin.

V. & E. Friedland, Ltd.—Private company. Registered December 3rd. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in electrical transformers, electrical accessories and apparatus, radio accessories, &c. The directors are: E. Friedland, 2, Summerhill Road, N.15, S. Friedland, "Shangri la," Sudbury Court Drive, Harrow, and J. Doggart, 9, Cavendish Road, N.4. Secretary: J. Doggart. Registered office: 156-8, Fairfax Road, N.8.

Bell Electric (Northfield), Ltd.—Private company. Registered November 30th. Capital, £100. Objects: To acquire the business of a radio dealer and electrician, carried on by E. N. Belsten, at 1279, Bristol Road South, Northfield, Birmingham. The subscribers are: C. A. Mulley, 1279, Bristol Road South, Northfield, Birmingham, and A. P. Bardell, 36, Paradise Street, Birmingham. C. A. Mulley is first director: Registered office: 1279, Bristol Road South, Northfield, Birmingham.

H. H. Electric, Ltd.—Private company. Registered December 10th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in electric lamps, radiators, fires, cookers, irons, vacuum cleaners and household and domestic appliances, and electrical, wireless and general engineers, &c. The directors are: H. Herzog (of German nationality), 146, Sutherland Avenue, W.9; and W. A. Harvey, 17, Vernon Drive, Stanmore, Middlesex. Registered office: 32, Clifton Road, Maida Vale, W.9.

Returns of Electrical Companies

Statements of Capital

W. R. Sykes Interlocking Signal Co., Ltd.—Capital, £37,550 19s. in 46,173 "A" shares of 10s. and 41,327 "A" shares of 7s. Return dated September 13th, 1938. 41,327 "A" shares of 7s. taken up. £7,656 12s. paid (3s. 6d. per share, plus £424 7s. 6d. paid on forfeited shares). £7,232 4s. 6d. considered as paid (3s. 6d. per share). Mortgages and charges, nil.

Vincent Switchgear Manufacturing Co., Ltd.—Capital, £10,000 in £1 shares. Return dated September 14th, 1938. 7,948 shares taken up. £7,948 considered as paid. Mortgages and charges, £3,000.

Luminous Signs, Ltd.—Capital, £3,000 in £1 shares. Return dated September 20th, 1938. All shares taken up. £2,750 paid. £250 considered as paid. Mortgages and charges, £1,700.

Killamarsh and District Electric Supply Co., Ltd.—Capital, £6,000 in £1 shares. Return dated September 26th, 1938. 4,725 shares taken up. £4,725 paid. Mortgages and charges, nil.

Ellis & Ward, Ltd.—Capital, £10,000 in 2,000 preference and 8,000 ordinary shares of £1. Return dated September 26th, 1938. 1,000 preference and 6,003 ordinary shares taken up. £1,003 paid on 1,000 preference and three ordinary shares. £6,000 considered as paid on 6,000 ordinary shares. Mortgages and charges, nil.

J. & F. Stone Lighting and Radio, Ltd.—Capital, £600,000 in 200,000 preference shares of £1 and 1,600,000 ordinary shares of 5s. Return dated October 3rd, 1938. 193,880 preference and 1,600,000 ordinary shares taken up. £476,380 paid on 193,880 preference and 1,130,000 ordinary shares. £117,500 considered as paid on 470,000 ordinary shares. Mortgages and charges, nil.

E. C. Stokes, Ltd.—Capital, £1,000 in £1 shares. Return dated August 20th, 1938. 502 shares taken up. £2 paid. £500 considered as paid. Mortgages and charges, £450.

Claude B. Barton, Ltd.—Capital, £1,000 in £1 shares. Return dated September 14th, 1938. 900 shares taken up. £900 paid. Mortgages and charges, nil.

G. A. Nicholas, Ltd.—Capital, £2,000 in £1 shares. Return dated September 28th, 1938. 1,450 shares taken up. £1,450 paid. Mortgages and charges, nil.

Warren Brothers (Middlesbrough), Ltd.—Capital, £20,000 in 16,000 ordinary and 4,000 deferred shares of £1. Return dated September 29th, 1938. 8,030 ordinary and 4,000 deferred shares taken up. £7,904 paid on 7,904 ordinary shares. £4,126 considered as paid on 126 ordinary and 4,000 deferred shares. Mortgages and charges, nil.

Linealux, Ltd.—Capital, £1,000 in £1 shares. Return dated November 3rd, 1938. 502 shares taken up. £502 paid. Mortgages and charges, nil.

Mortgages and Charges

Metropolitan Electric Supply Co., Ltd.—Particulars have been filed of three per cent. debenture stock to secure £1,750,000 (inclusive of £1,000.000 stock already registered) authorised November 8th, 1938, and covered by trust deed dated November 18th, 1938 (supplemental to trust deed dated April 7th, 1936), charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £750,000. The trustees are the Trustees Corporation, Ltd. (The present stock is issued at a discount of 14½ per cent.)

Campbell & Isherwood, Ltd.—Satisfaction in full on April 21st, 1923, of equitable charge registered April 30th, 1921. (Notice filed December 1st, 1938.) (According to the register of mortgages, the mortgage registered April 30th, 1921, originally secured all moneys due to bank.)

City of London Electric Lighting Co., Ltd.—Satisfaction in full on December 31st, 1937, of trust deed dated February 26th, 1894, and registered July 31st, 1908, securing £500,000 5 per cent. first debenture stock, inclusive of premium of 25 per cent. (Notice filed November 29th, 1938.)

Receivers Appointed and Released

D.C. Electric Co., Ltd.—F. V. L. Redman, Chartered Accountant, 1, Tudor Buildings, Swanage, was appointed receiver and manager November 30th, 1938, under powers contained in debentures dated December 17th, 1937.

Amcolite, Ltd.—H. Taylor, lithographic manufacturer, of Bath Vale View, Buglawton, Ches, was appointed receiver and manager on November 29th, 1938, under powers contained in debenture dated December 16th, 1937.

Neon Installations, Ltd.—B. Davis, of 169, Regent Street, W.1, ceased to act as receiver and/or manager on December 1st, 1938.

Weldries (1922), Ltd.—F. H. G. Williams, of 55-56, Chancery Lane, W.C.2, was appointed receiver and manager on November 29th, 1938, under powers contained in debenture dated August 16th, 1937.

Reports and Dividends

The County of London Electric Supply Co., Ltd.—The subscription list opened on Wednesday last for an issue of 1,250,000 ordinary shares of £1 each at 43s. 6d. per share. Payment of calls is spread over a period of six months, but the new capital is to rank *pari passu* with existing ordinary capital as from January 1st next, so that the new shares will receive the interim dividend due in September, 1939. The new issue is being made to provide funds for further general development, including development of its subsidiary and associated undertakings.

The North Metropolitan Electric Power Supply Co.—The subscription list opened and closed on Monday last for an issue of £1,000,000 4 per cent. cumulative preference stock at par. The proceeds of the issue will be applied to the general development of the company's business.

The General Cable Manufacturing Co., Ltd., reports a profit for the year ended September 30th of £23,124, as compared with £25,826 in the preceding year. The final ordinary dividend is 6 per cent., making 12 per cent. for the year (against 13 per cent.), and £1,777 is carried forward.

Petters, Ltd.—As part of its arrangements with the Brush Electrical Engineering Co., Ltd., it was agreed that that com-

pany should have the right to form a new company with the name of Petters, Ltd., in order that the goodwill of the name should be preserved. An extraordinary meeting of Petters is therefore being held on December 30th at which resolutions will be submitted for changing its name to Associated British Engineering, Ltd., and for altering the memorandum of association of the company with respect to its objects.

The Plessey Co., Ltd., reports a trading profit of £288,128, plus interest of £1,900, making £290,028, for the year ended June 30th. Net available earnings on the ordinary shares were £163,230, or 65.3 per cent. net. The dividend is 40 per cent. The profit for the preceding six months was £58,253, or £116,506 per annum. A dividend of 20 per cent. was paid on the ordinary shares. The company was made public last year.

International Combustion, Ltd., has announced a final dividend of 12½ per cent., and a cash bonus of 12½ per cent. This, with the interim dividend of 7½ per cent., makes 32½ per cent. for the year. The dividend is the same as for the previous year, but the bonus is increased by 2½ per cent.

Ismay Industries, Ltd.—The *Financial Times* states that it was reported in the market on Tuesday last that the company had sold its lamp holdings to an influential group.

The Rheostatic Co., Ltd., is paying a final dividend of 4 per cent., less tax, on the ordinary shares, making 8 per cent. for the year (against 12 per cent. for the preceding year).

Lisbon Electric Tramways, Ltd., is again paying an interim dividend of 3 per cent.

The Victoria Falls & Transvaal Power Co., Ltd., has declared an interim dividend of 4 per cent., less tax (same) on the ordinary shares, a dividend of 3 per cent. on the preference for the half-year ending December 31st, and a further dividend of 4 per cent., being participating rights for the year ending December 31st, both less tax (same).

Marco Refrigerators, Ltd., reports a trading profit for the year ended September 30th of £2,758, as compared with £8,075 in the preceding year. After providing for expenses and depreciation (£4,879), there is a loss of £2,121 (against a profit of £4,069), less £115 brought in, leaving £2,006. Meeting: December 21st.

The Electric Furnace Co., Ltd., has announced an interim dividend of 2½ per cent. (same).

The British Vacuum Cleaner & Engineering Co., Ltd., is paying a final dividend of 30 per cent., less tax, making 40 per cent. for the year (unchanged).

George Kent, Ltd., have declared an interim ordinary dividend of 3 per cent., less tax (same).

The United River Plate Telephone Co. has declared an interim dividend of 1 per cent., less tax (same).

W. & T. Avery, Ltd., have announced an interim dividend of 5 per cent. on the ordinary shares (same).

Greenwood & Batley, Ltd., have announced an interim dividend of 3 per cent. (same).

The Compania Hispano-Americana de Electricidad (Chade) has announced an interim dividend of m$n. 22.50 on the "A," "B" and "C" shares and m$n. 4.50 on the "D" and "E" shares (against m$n. 20 and m$n. 4 a year ago).

Stocks and Shares

TUESDAY EVENING.

A DISQUIETING factor at the present time in British markets is the dwindling of prices in British Government and similar securities. For some time past, theory has maintained that, in view of armament and national defence expenditure, the "safety first" stocks stood in a vulnerable position, in that, with the resort to fresh national borrowing, a lower level of prices seemed to be at least probable. It cannot be said, however, that this anticipation has made its fulfilment any the more palatable to investors who hold such stocks, and who are faced with the possibility of a further crumbling of values until the time arrives when the enormous expenditure essential for defence comes within sight of finality.

The pressure upon gilt-edged markets makes its influence felt upon a wide area of other departments. Fortunately, Sir John Simon has been speaking this week in optimistic vein of the prospects for trade and industry. It may happen that after the turn of the year a feeling of greater confidence will become manifest in the minds of people who at present confess candidly that they prefer to keep their money in the bank for the time being, rather than to make investments in stocks and shares.

Electricity Legislation

The market in electricity supply shares is pleased to see a movement on foot towards easing matters for the industry during the long wait for legislation. Options held by local authorities to purchase electricity undertakings form the bone of contention. A large number of those options will mature during the coming five years. Permission to exercise all of these rights may be neither wanted nor allowed, but the mere fact of their existence is claimed to be acting as a drag on the development of the industry. In other words, no company under the threat of transfer feels inclined to embark on fresh capital expenditure which it would otherwise undertake. The suggestion is for a "standstill" agreement by which the options would be suspended for a breathing space of, say, five years, or until legislation proper is decided upon. A short Bill on these lines is understood to be under consideration for early submission to Parliament. Holders of shares in the industry will doubtless wish it success. Meanwhile some weak spots have appeared in the market, London Electrics at 33s., North Easterns at 30s., and Yorkshire Electrics at 38s. 6d., all being 1s. down.

County of London Electric

County of London ordinary shares have fallen to 44s. on appearance of the offer of 1,250,000 new ordinary shares at 43s. 6d. The money is required for the general development purposes of the company. Instalments are spread over six months, the final call being due on June 26th next year. Underwriting commission is 9d. and overriding another 2d. per share. Subscription lists opened and closed on Wednesday in this week. The price of the existing shares has ranged between 51s. 9d. and 38s. 9d. during 1938. In normal times it would have been safe to assume a ready public welcome for the issue. With things as they are—to quote the popular aphorism—the result of the County of London's offer is awaited with lively interest.

Equipment and Manufacturing

For the industrial markets, the week's chief event has been the cut in steel prices. A lack of response in the shares of steel manufacturing shares suggests an undecided opinion of the decision in the market most directly concerned. Elsewhere, there were signs of interest in those directions where cheaper steel supplies will help profits. Generally speaking, industrials have had a poor week, explanation for the dullness of prices being found in the old story of absent buyers at a time of light selling pressure. In the electrical equipment section, however, there are few changes, and moderate activity has continued in the more popular shares of the moment such as English Electrics and Associated Electrical Industries. Callenders have dropped half-a-crown for the second week in succession and are now 3⅞. British Insulated at 4⅛ have lost 3s. 9d. Crompton Parkinsons, which have been weak since the report and the announcement of the new dividend policy, have fallen further to 24s., still cum 50 per cent. scrip bonus. When quoted ex-all the shares will present the unusual spectacle—for them—of a respectable yield on the cash dividend alone. In the more general engineering group there are losses of 1s. or more in Murex at 77s. 6d., Babcock & Wilcox at 35s. 9d., and Greenwood & Batley at 26s. 3d. International Combustions were unaffected by the increase in the dividend from 30 to 32½ per cent.

More Electrical Preference Shares

Issues of stocks giving respectable security are staving off stagnation from the new capital market. Electrical companies are supplying a fair quota of the issues. Following closely on the British Power and Light Company's successful sale of 600,000 4½ per cent. preference shares at 21s., the North Metropolitan Electric has offered £1,000,000 4 per cent. preference stock at par. Both issues, it may be noted, respect the popular prejudice against paying a high premium for this class of stock. As it happens, each company has already in issue a 6 per cent. stock with which the newcomers will rank equally; and in each case the lower-priced of the two is relatively the higher valued. Having regard to the company's standing, the new "Northmet" preference comes near to gilt-edged status. On last year's profits the full preference capital service is covered three times. It is reported that public subscriptions covered less than three-quarters of the amount offered. British Power and Light preference has developed a small premium. The Scottish Power 4 per cent. preference shares issued a month or so ago are standing 1s. premium over the prospectus price of 20s.

Communication and Transport

Because of the view taken of the cable traffic position and of the newest Empire wireless plans, Cable and Wireless stocks have fallen below the prices recorded even during the black September days. The ordinary, at 34½, has dropped 3½, and the preference, at 79, is 2 points down. Signs of resistance appeared, however, at the beginning of this week. Western Unions are no better than 24½ dollars. The fall in Great Northern Telegraphs has continued down to 36½.

The Home Railway market awaits news of the fate of the companies' "square deal" claims at the hands of the Transport Advisory Committee. The outcome is regarded with subdued hope. Of the Southern Railway issues, the 5 per cent. preference has fallen from 91½ to 88¾, but the preferred is unchanged after an earlier setback. London Transport "C" stock—also the subject of momentous deliberations—has given way from 77½ to 75. The main contention of the railway companies is that they ought no longer to be bound by statutory regulations as to charges, &c. They want to be placed on an equality with road transport undertakings. The Minister of Transport seems to feel a good deal of sympathy with the Railways' claim to consideration in these respects.

Taylor Tunnicliff

Dealings have begun, at around par, in the Taylor Tunnicliff (Electrical Industries) 5½ per cent. preference shares offered last week at 21s. The issue was called for by the company's acquisition of the capital of a group of electrical manufacturing companies. The company's ordinary shares were issued as part of the latter's purchase consideration. Profits of the business have been little less than trebled since 1932, last year's figure being about eight times greater than the amount required to pay the preference dividend. On the average results of the last three years, the margin is six-fold. At their present price of 21s. the shares give a return of £5 4s. 9d. per cent. on the money.

Electrical Companies' Shares

Prices, dividends and yields

Company.	1938. Highest.	1938. Lowest.	Dividend. Previous.	Dividend. Last.	Price Dec. 13.	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies.							
Bournemouth and Poole	68/3	62/–	15	15	67/6	–9d.	4 9 0
British Power & Light	30/9	24/6	6	7	28/–	—	4 18 3
City of London	34/6	28/6	7½	7½	32/–	—	4 13 9
Clyde Valley	42/6	33/–	8	8	36/3	—	4 8 2
County of London	51/9	38/9	10½	10½	44/–	–2/–	4 15 5
Edmundson's :							
7% Pref.	33/3	30/–	7	7	31/3	—	4 9 6
Ord.	40/9	18/9	9	9	25/6xd.	–6d.	—
Elec. Dis. Yorkshire	43/6	37/9	9	9	41/3	—	4 7 5
Elec. Fin. and Securities	51/9	49/–	12½	12½	47/6xd.	—	5 5 3
Elec. Supply Corporation	55/–	50/–	12	12	52/6	—	4 11 5
Isle of Thanet	21/3	18/6	4	4	20/–	—	4 0 0
Lancs Light and Power	35/–	26/–	7½	7½	31/3	—	4 16 0
Llanelly Elec.	23/6	21/–	5½	5½	21/6	—	5 2 4
Lond. Assoc. Electric	32/9	28/–	7	7	30/–	–9d.	4 13 4
London Electric	36/3	32/–	7	7	33/–	–1/–	4 4 10
London Power Deb. Red.	108¾	100	5	5	106	—	4 14 6
Metropolitan	51/–	41/–	10	12	48/3	—	4 19 7
Midland Counties	39/9	33/–	8	8	36/3	—	4 4 3
Mid. Elec. Power	41/9	37/–	8	9	40/–	—	4 10 0
Newcastle Elec.	31/9	27/6	7	7	28/9	—	4 17 4
North Eastern Electric :							
Ordinary	34/–	25/–	7	7	30/–	–1/–	4 13 4
7% Pref.	34/–	30/–	7	7	32/6	—	4 6 2
Northampton	47/6	43/9	10	10	46/3	—	4 6 7
Notting Hill 6% Pref. (£10)	14½	13½	6	6	13½	—	4 12 4
North Met. Elec. :							
Ordinary	49/–	43/–	10	10	45/9	–6d.	4 7 9
6% Pref.	30/6	28/3	6	6	29/6	—	4 1 4
Richmond Elec.	30/6	28/–	7	7	28/9	—	4 17 5
Scottish Power	38/9	32/–	8	8	35/–	–9d.	4 11 6
Southern Areas	22/9	18/6	4½	5	21/3	—	4 14 1
South London	32/6	31/–	7	7	31/6	—	4 9 0
West Devon	23/3	21/3	5	5	1½	—	4 9 0
West Glos.	19/–	16/9	2	2	19/–	—	2 2 1
Yorkshire Elec.	42/–	36/9	8	8	38/6	–1/–	4 3 0
Overseas Electricity Companies.							
Atlas Elec.	4/6	2/6	Nil	Nil	2/9	—	—
Calcutta Elec.	44/3	36/3	12*	10*	2	—	5 0 0
Cawnpore Elec.	40/–	35/–	10	10	36/3	—	5 10 6
East African Power	28/3	22/6	7	7	24/–	+6d.	5 16 8
Jerusalem Elec.	26/9	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	12/–	9/6	7½	7½	10/3	—	7 6 4
Madras	34/6	28/9	8*	8*	30/–	—	5 6 8
Montreal Power	31¾	26¾	1½	1½	32½	—	—
Palestine Elec. "A"	31/9	27/–	7½*	7½*	30/–	—	5 0 0
Perak Hydro-electric	25/3	17/–	7	6	18/9	—	6 8 1
Shawinigan Power	23½	16½	65cts.	85cts.	22	—	—
Tokyo Elec. 6%	65½	39	6	6	57½	—	10 8 8
Victoria Falls Power	76/3	55/–	12	13½	68/9	–⅛	3 18 6
Whitehall Investments Pref.	22/3	15/–	7½	7½	17/6	—	8 11 6
Public Boards.							
Central Electricity :							
1950–70	115¾	97	5	5	110½	—	4 10 6
1955–75	118½	100	5	5	113½	—	4 8 1
1951–73	111	95	4½	4½	107	—	4 3 9
1963–93	101	85	3½	3½	95½	—	3 13 4
London Elec. Trans. Gtd.	93½	88	2½	2½	89½	–1	2 15 10
London & Home Counties,							
1955–75	112¾	97½	4½	4½	110	—	4 1 10
Lond. Passenger Transport :							
A	119½	104¾	4½	4½	109½	—	4 2 2
B	122¾	105	5	5	114½	—	4 7 4
C	84	68	4½	4	75	–2½	5 6 8
West Midlands Joint Elec.,							
1948–68	115½	102½	5	5	113	—	4 8 6
Telegraph and Telephone.							
American Tel. & Tel.	154½	114	9	9	158½	—	5 13 7
Anglo-Am. Tel. :							
Pref.	115½	100½	6	6	100½	—	5 19 5
Def.	28	23	1½	1½	23	—	6 10 5
Anglo-Portuguese	23/6	19/3	8	8	21/3	—	7 10 7
Cable & Wireless :							
5½% Pref.	104	78	4½	5½	79	–2	6 19 3
Ord.	67¾	34	—	4	34½	–3½	11 12 0
Income	102½	99	—	—	99½	—	4 0 5
Canadian Marconi $1	6/6	3/9	—	Nil	4/9	–3d.	—
Globe Tel. & Tel. :							
Ord.	32/6	26/3	5½*	7½*	26/3	–⅛	5 14 3
Pref.	27/6	23/9	6	6	26/3	—	4 11 5
Great Northern Tel. (£10)	42½	34	20	20	36½	–1	5 9 8
Inter. Tel. & Tel.	12½	5¾	Nil	Nil	9½	—	—
Marconi-Marine	30/6	21/6	10	7½	23/9	—	6 6 4
Oriental Telephone Ord.	59/3	2½	12*	12*	2¾	—	4 11 3
Radio Corpn.	9½	4¾	8	6	8	—	—
Telephone Props	13/9	11/3	5	6	12/6	—	9 12 0
Telephone Rentals (5/–)	10/–	7/6	5	6	9/3	—	3 4 10
Western Union	34½	17	2½	—	24½	–2	—
Traction and Transport.							
Anglo-Arg. Trams :							
First Pref.	11/–	2/6	Nil	Nil	3/9	—	—
4% Inc.	31	8	Nil	Nil	9	—	—
British Electric Traction :							
Def. Ord.	1060	675	5	5	900	—	—
Pref. Ord.	175	150	8	8	165	—	4 17 0
Bristol Trams	45/–	34/3	5	8	2	—	4 0 0
Brazil Traction	14½	7½	70cts.	$1	9⅞	–½	—
Calcutta Trams	26/9	21/6	8	8	24/6	—	6 10 8
Cape Elec. Trams	18/6	15/6	5	6	17/6	—	6 17 2
Lancs Transport	35/3	29/3	10	10	36/3	—	5 10 3
Mexican Light :							
1st Bonds	39	16½	5	5	25	—	—
Rio 5% Bonds	91	47	5	5	60	—	8 6 8
Southern Rly :							
5% Prefd.	87	48	5	—	57½	—	—
5% Pref.	116	83	5	5	88½	–3	5 13 0
T. Tilling	60/–	36/6	10	10	42/6	—	4 14 1
Tilling & B.A.	57/–	46/–	6	10	50/–	—	4 0 0
West Riding	46/3	30/6	10	10	33/9	—	—
Equipment and Manufacturing.							
Aron Electricity Ord.	40/3	31/–	15	15	1⅝	—	9 12 0
Assoc. Elec. :							
Ord.	45/3	32/–	10	10	39/–	—	5 2 8
Pref.	38/9	35/6	8	8	36/6	—	4 7 8
Automatic Telephone & El.	43/–	35/–	5	10	41/3	—	4 17 1
Babcock & Wilcox	44/–	32/6	10	10	35/9	–1/9	5 11 8
British Aluminium Ord.	54/–	40/–	10	12½	54/6	—	4 11 9
British Insulated Ord.	95/9	77/–	20	20	4½	–⅛	4 16 10
British Thermostat (5/–)	16/–	9/–	17½	18½	15/9	—	5 17 6
British Vacuum Cleaner	35/9	27/6	5	6	28/3	—	4 5 0
Brush Ord.	5/6	4/9	Nil	Nil	5/–	—	—
Callender's	5½	78/6	20	20	77/6	–½	5 3 3
Chloride Elec. Storage	77/9	61/–	15	20	77/6	—	5 3 3
Consolidated Signal	116/–	75/–	30	36½	4¾	—	7 13 7
Crabtree (10/–)	29/–	22/–	17½	17½	24/6	—	7 2 10
Crompton Parkinson :							
Ord. (5/–)	32/3	18/9	12½	15	24/–	–1/–	—
E. K. Cole (5/–)	8/9	4/6	5	10	6/–	–6d.	8 6 8
Elec. & Musical Industries (10/–)	16/3	9/–	10	5	11/–	—	4 11 0
Electric Construction	36/–	31/–	10	12½	32/6	—	7 13 10
Enfield Cable Ord.	5⅜	46/–	25	25	2¾	—	—
Electrical Switchgear (10/–)	27/–	22/6	16	16	25/9	—	6 4 4
English Electric	33/–	24/6	Nil	10	33/–	—	6 1 3
Ensign Lamps (5/–)	14/3	11/3	—	25	14/–	—	8 18 6
Ericsson Tel. (5/–)	2⅛	31/–	25*	25*	2	–⅛	3 2 6
Ever Ready (5/–)	26/3	16/6	45	35	21/–	—	8 6 8
Falk Stadelmann	34/3	27/–	10	10	27/6	—	7 5 6
Ferranti Pref.	27/6	25/6	7	7	27/6	—	5 2 0
G.E.C. :							
Pref.	34/–	31/3	6½	6½	31/3	—	4 3 2
Ord.	79/3	67/–	17½	20	77/–	–6d.	5 4 0
Greenwood & Batley	27/6	19/–	7	15	26/3	–⅛	11 8 6
Hall Telephone (10/–)	24/6	18/3	5	15	21/3	—	7 1 2
Henley's (5/–)	21/–	16/–	15	20	19/6	–6d.	5 2 7
4½% Pref.	23/–	22/–	4½	4½	22/6	—	4 0 0
Hopkinsons	40/–	32/6	10	12½	38/9	–9d.	6 8 10
India-Rubber Pref.	21/9	20/3	5½	5½	21/3	—	5 3 6
Intl. Combustion	5½	4½	30	32½	5½	—	5 18 3
Ismay Industries (5/–)	6/9	1/–	6	6	1/3	—	—
J. Lucas	57/9	47/6	15	15	56/3	—	5 6 9
Johnson & Phillips	43/9	32/6	10	12½	36/3	—	6 13 4
Lancashire Dynamo	72/3	53/–	20	25	65/–	–⅛	7 14 0
Laurence Scott (5/–)	12/–	9/–	7	15	12/–	—	6 5 0
London Elec. Wire	35/–	28/3	12	7½	29/6	—	5 1 8
Mather & Platt	49/–	41/3	12	13½	46/3	—	5 17 0
Metropolitan Elec. Cable Pf.	22/–	21/–	5½	5½	21/3	—	5 3 6
Murex	93/9	66/3	20	20	77/6	–⅛	5 3 3
Pye Deferred (5/–)	12/–	8/–	5	25	9/6	—	13 3 2
Revo (10/–)	36/3	30/–	12	17½	35/–	—	5 0 0
Reyrolle	62/6	49/–	12½	12½	55/9	—	4 10 0
Siemens Ord.	31/–	20/6	7½	7½	23/9	—	6 6 4
Strand Elec. (5/–)	6/–	4/–	5	10	5/–	—	10 0 0
S. Smith (1/–)	9/9	6/3	37½	50	8/9	—	6 6 0
Switchgear & Cowans (5/–)	19/6	12/6	20	20	15/–	—	6 13 4
Telegraph Condenser (10/–)	18/9	12/–	5	5	12/6	—	4 0 0
Telegraph Construction	2½	36/–	7½	10	2½	—	4 14 1
Telephone Mfg. (5/–)	9/9	7/–	9	9	8/9	—	5 2 10
Tube Investments	89/6	70/–	23¾	23¾	4½	—	5 15 6
Vactric (5/–)	9/9	5/–	10	10	5/–	—	10 0 0
Vickers (10/–)	27/–	17/6	10	10	22/6	–9d.	4 9 6
Westinghouse Brake	63/9	45/–	15	17½	54/–	–2/–	6 9 8
Walsall Conduits (4/–)	26/–	22/6	—	55	25/9	—	8 11 0
West, Allen (5/–)	6/6	4/6	—	7½	6/6	—	5 15 5

* Dividends are paid free of Income Tax.

New Patents

Electrical specifications recently published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1936

17772. "Television distributing systems." Baird Television, Ltd., and L. R. Merdler. May 20th, 1937. (495822.)

1937

4305. "Telegraph systems." C. Lorenz Akt. Ges. February 14th, 1936. (595561.)

4454. "Cathode-ray tubes." Radioakt Ges. D. S. Loewe. February 19th, 1936. (495757.)

7328. "Alternating-current rectifying arrangements comprising gaseous discharge valves." British Thomson-Houston Co., Ltd. March 12th, 1936. (495565.)

7712. "Electric timing circuits." British Thomson-Houston Co., Ltd. March 16th, 1936. (495700.)

10662. "Photo-electric control systems for machine tools and other machines and apparatus." Associated Equipment Co., Ltd., and E. J. H. Jones. April 14th, 1937. (495762.)

10905. "Contactors for electric circuits." Igranic Electric Co., Ltd., and W. F. Grafton. April 16th, 1937. (495705.)

11003. "Focusing systems for use in electric-discharge tubes." F. H. Nicoll. April 17th, 1937. (495707.)

11902. "Lamp enclosures." British Thomson-Houston Co., Ltd. April 25th, 1936. (495641.)

13477. "Electric push-button switches." M. & C. Switchgear, Ltd., and R. Morrison. May 13th, 1937. (495643.)

13523. "Electric accumulators." Compagnie Générale d'Electricite. May 27th, 1936. (495710.)

13587. "Variable electric condenser assembly with multiple units for keyboard operation." R. Kapp. May 13th, 1936. (Addition to 486605.) (495767.)

13690. "Television reproducer apparatus." Marconi's Wireless & Telegraph Co., Ltd., and L. M. Myers. May 14th, 1937. (Cognate application 23299/37.) (495646.)

13832. "Methods of manufacturing fluorescent materials for cathode-ray tubes." Fernseh Akt. Ges. May 18th, 1936. (495774.)

13845. "Electric motors." British Thomson-Houston Co., Ltd., and L. D. Anscombe. May 18th, 1937. (495775.)

13857. "Electrically heated laundry irons." G. E. Green. May 18th, 1937. (495776.)

13894. "Electric generators." J. H. Holmes & Co., Ltd., and J. W. Bayles. May 18th, 1937. (495779.)

13904. "Manufacture of electric fuseheads such as are used, for example, in blasting detonators." W. Taylor, C. R. L. Hall and Imperial Chemical Industries, Ltd. May 18th, 1937. (495832.)

13906. "Manufacture of electric fuseheads such as are used, for example, in blasting detonators." B. Campbell and Imperial Chemical Industries, Ltd. May 18th, 1937. (495833.)

13907. "Devices for converting electric oscillations into sound." A. I. Abrahams. May 18th, 1937. (495784.)

13971. "Electric welding apparatus." British Thomson-Houston Co., Ltd. May 19th, 1936. (495484.)

14041. "Electric motors." Crocker Wheeler Electric Manufacturing Co. May 23rd, 1936. (495791.)

14101. "Current supply arrangements for use in telephone or like systems." Automatic Telephone & Electric Co., Ltd., and E. Frydman. May 20th, 1937. (495795.)

14151. "Insulated electrical conductors." Pirelli-General Cable Works, Ltd., and G. Martinez. May 21st, 1937. (495837.)

14179. "Variable electric resistances." Standard Telephones & Cables, Ltd., and W. H. M. Hellier. May 21st, 1937. (495799.)

14181. "Teleprinter exchange systems." Standard Telephones & Cables, Ltd. (L. B. Haigh and P. J. Clemens). May 21st, 1937. (495800.)

14182. "Electron multipliers." Standard Telephones & Cables, Ltd. July 31st, 1936. (495839.)

14183. "Circuits using gas-filled electric discharge tubes." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). May 21st, 1937. (495801.)

14196. "Automatic telephone systems." Telefonaktiebolaget L. M. Ericsson. May 22nd, 1936. (495802.)

14212. "Electric motor control systems." British Thomson-Houston Co., Ltd. May 21st, 1936. (495840.)

14703. "Magneto-electric machines." J. Bohli. May 27th, 1936. (495813.)

14991. "Electrical indicating instruments." Evershed & Vignoles, Ltd., and G. B. Rolfe. May 29th, 1937. (495485.)

15441. "Electric transformers." Marklin & Cie. Ges. Geb. June 4th, 1936. (Cognate application 15442/37.) (495486.)

15729. "Television receiving systems." A. D. Blumlein. June 7th, 1937. (495724.)

16812. "Application of indicators to electric tumbler switches." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. June 17th, 1937. (495577.)

16878. "Electrical apparatus comprising one or more electric heating devices." A. F. Berry. June 17th, 1937. (495578.)

17436. "Aerials and feeder systems." E. C. Cork and J. L. Pawsey. June 23rd, 1937. (495489.)

19072. "Circuit arrangements for automatic selecting switches in telephone systems." Siemens Bros. & Co., Ltd., D. P. Long and C. L. Peters. July 9th, 1937. (495582.)

19395. "Current convertors comprising electric-discharge devices having liquid cathodes." General Electric Co., Ltd., and D. G. Prinz. July 13th, 1937. (495495.)

19538. "Sound-translating apparatus." Standard Telephones & Cables, Ltd. January 30th, 1937. (495496.)

20793. "Fluid-cooling arrangements for electron-discharge tubes." Marconi's Wireless Telegraph Co., Ltd. July 30th, 1936. (495663.)

22802. "Electric-discharge lamps comprising a refractory body adapted to be heated to incandescence by discharge." General Electric Co., Ltd. (Patent Treuhand Ges. für Elektrische Glühlampen). August 19th, 1937. (495731.)

23298. "Cathode-ray tuning indicators." M-O Valve Co., Ltd., M. Benjamin and H. S. Smith. August 25th, 1937. (495732.)

23556. "Electrical switches." British Thomson-Houston Co., Ltd. August 28th, 1936. (495587.)

25191. "Negative glow electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges für Elektrische Glühlampen). September 16th, 1937. (495666.)

26263. "High-pressure metal vapour lamps and means for operating them." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). September 28th, 1937. (495591.)

28460. "Loudspeaker horn." Standard Telephones and Cables, Ltd. November 13th, 1936. (495594.)

29023. "Electric distant control systems." E. Granat and Compagnie des Forges et Acieries de la Marine et d'Homecourt. November 20th, 1936. (495595.)

29392. "Tuning indicators in radio receiving-apparatus." General Electric Co., Ltd., and A. Bloch. October 27th, 1937. (495596.)

31865. "Systems for the transmission of oscillations." J. Collard and M. Bowman Manifold. February 18th, 1937. (Divided out of 476799). (Cognate application 464/38.) (495815.)

32004. "Production of synchronising signals in television transmitters." Radioakt. D. S. Loewe. November 26th, 1936. (495599.)

32104. "Thermionic valves and like electric discharge devices." M-O Valve Co., Ltd., and C. J. Smithells. November 22nd, 1937. (495739.)

33279. "Determination of the direction of incidence of oscillatory phenomena." W. W. Triggs (Brown Boveri and Cie. A.G.). December 1st, 1937. (Convention date not granted.) (495515.)

33711. "Electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). December 6th, 1937. (495601.)

34451. "Photo-electric cells." British Thomson-Houston Co., Ltd. December 14th, 1936. (495674.)

35498. "Image transmission systems." Electrical Research Products Inc. December 24th, 1936. (495740.)

35701. "Arrangement for adjusting self-inductance coils." E. Michaelis. December 24th, 1936. (495605.)

1938

1965. "Electrical condensers and methods of manufacturing the same." Naamlooze Vennootschap Fabriek van Electrische Apparaten, Voorheen F. Hazemeyer and Co. January 20th, 1937. (495607.)

2070. "Electron-discharge apparatus." Standard Telephones & Cables, Ltd. February 26th, 1937. (495529.)

2807. "Cathode-ray device." Standard Telephones & Cables, Ltd. March 31, 1937. (495531.)

3406. "Electrical remote-control and indicating systems." E. Kasemann. February 3rd, 1937. (495609.)

4813. "Electric incandescent lamps." Glühlampenfabrik Gloria Akt. Ges. February 19th, 1937. (495533.)

6424. "Methods of indicating distance by wireless." R. J. Berry (C. Lorenz Akt. Ges.). March 1st, 1938. (495613.)

6854. "Electron multipliers." Standard Telephones & Cables, Ltd. July 31st, 1936. (Divided out of 495839.) (495843.)

7392. "Electric carrier signalling systems." Siemens & Halske Akt. Ges. March 9th, 1937. (495538.)

8230. "Electric circuit interrupters of the liquid immersed type." Westinghouse Electric & Manufacturing Co. May 28th, 1937. (495540.)

9054. "Methods of manufacturing filaments of electric lamps." British Thomson Co., Ltd. March 24th, 1937. (495749.)

9207. "Gain control circuits for electric signal transmission systems." Standard Telephones & Cables Ltd. May 28th, 1937. (495620.)

9753. "Means for testing the electrical ignition systems of internal-combustion engines." D. Napier & Son Ltd., and F. R. F. Ramsey. April 10th, 1937. (Divided out of 495478.) (495547.)

10280. "Carbon arc lamps." Zeiss Ikon Akt. Ges. June 14th, 1937. (Addition to 471647.) (495623.)

11113. "Electric gas discharge lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 13th, 1937. (495549.)

11218. "Antenna arrangements especially for radio beacons." C. Lorenz Akt. Ges. April 14th, 1937. (495624.)

11365/6. "Electric gas discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 16th, 1937. (495550/1.)

13159. "Junction fittings for coaxial cables." Standard Telephones & Cables, Ltd. May 25th, 1937. (495689.)

13454. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 8th, 1937. (495752.)

14360. "Electric-discharge vessels." C. Lorenz Akt. Ges. May 14th, 1937. (Cognate application 14361/38.) (495690.)

15101. "Receiving arrangements for radio direction-finder systems." R. J. Berry, C. Lorenz Akt. Ges. May 20th, 1938. (495554.)

17002. "Electrodes for electric accumulators." Chloride Electrical Storage Co., Ltd. (C. A. Hall). June 8th, 1938. (495557.)

17733. "High-frequency chokes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 17th, 1937. (495631.)

18275. "Electric high-pressure metal-vapour discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 22nd, 1937. (495632.)

25008. "Electric control systems for machine tools and other machines and apparatus." Associated Equipment Co., Ltd., and E. J. H. Jones. April 14th, 1937. (Divided out of 495762.) (495818.)

Contract Information

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Aberdeen.—December 20th. Electrical and heating work at new hall at Boys' Brigade headquarters, Crimon Place. Geo. Bennet Mitchell & Son, architects, 1, West Craigstone Street, Bon-Accord Square. Electrical and heating works at new school at Middlefield. J. A. Ogg Allan, 77a, Union Street.

Atcham.—December 16th. R.D.C. Electrically operated pumping plant in duplicate. Willcox, Raikes & Marshall, 33, Great Charles Street, Birmingham (deposit £2 2s.).

Australia.—MELBOURNE.—January 3rd. Posts and Telegraph Department. Rubber-insulated, braided, distributing wire. (T. 29245/38.)*

January 31st. Postmaster-General's Department. Telephone relays. (T.30041/38.)*

January 23rd. City Council. Supervisory indicating equipment. (T. 29004/38.)*

April 26th. State Electricity Commission. 30,000-kW turbo-generating plant, condensing plant, pipework and accessories. (See this issue.)

Belfast.—December 16th. Electricity Department. Carbon-dioxide 'fire extinguishing equipments for sub-stations and sprayed asbestos fibre surfacing of steelwork. (December 9th.)

January 13th. Stores and materials for twelve months. (See this issue.)

Billingham-on-Tees.—U.D.C. Installation of electric lighting in forty houses on the Cowpen Lane estate. J. J. Hill, surveyor, Council Offices, Haverton Hill-on-Tees.

Bingley.—December 21st. Electricity Department. Two 400-kVA transformers. (December 9th.)

Bootle.—December 23rd. Borough Council. Sodium electric lighting in Southport Road. (December 2nd.)

Bridlington.—December 23rd. Town Council. Electrical wiring installation at the new electricity showrooms and offices, Quay Road. (See this issue.)

Brighton.—January 4th. Electricity Undertaking. One 5,000-kVA, 33/11-kV, outdoor type transformer. (See this issue.)

Chelmsford.—December 29th. Essex County Council. Electrical installation at the Agricultural College and Hostels at Writtle. (See this issue.)

Chigwell.—December 31st. U.D.C. Disintegrating pump for screening and a low-lift effluent pump, together with electric motors. Howard Humphreys and Sons, 17, Victoria Street, London, S.W.1 (deposit £2 2s.).

Cleethorpes.—December 30th. Electricity Department. High-voltage switchgear and one electric van. (December 2nd.)

Eastbourne.—January 10th. Electricity Department. Stores and materials for twelve months; wiring for hired and hire-purchase apparatus and for assisted wiring installations. (December 2nd.)

Ebbw Vale.—December 31st. Education Committee. Work on heating apparatus at Duffryn schools, including provision of circulating pump and electric motors. P. Davies, Council Offices (deposit £1 1s.).

Exeter.—January 3rd. Electricity Department. Three four-panel, 11,000-V metal-clad switchboards. (December 9th.)

Fife.—December 19th. County Council. Electric lighting at Freuchie (twenty houses), and Kingskettle (twenty houses and police house) estates. County Clerk (deposit £1 1s.).

India.—CEYLON.—March 31st. Crown Agents for the Colonies. Various works, including electrical plant, for the Ceylon Hydro-Electric Scheme. (December 2nd.)

NEW DELHI.—January 3rd. Indian Stores Department. One Diesel-engine driven generator with static balancer. (T.Y. 29676/38.)*

CALCUTTA.—January 14th. Indian Stores Department. Three Diesel-engine driven generators and complete power-house equipment. (T.Y. 29677/38.)*

Kent.—January 17th. County Council. Internal telephone systems at Chatham County Hospital and the Gravesend, Malling and Sundridge Institutions. Broadcast bells and buzzer systems at Farnborough, Sheppey and Chatham County Hospitals. (See this issue.)

Knaresborough.—December 17th. R.D.C. Provision and installation of an electrically driven bore-hole pump at the Council's waterworks at Burton Leonard. Clerk of the Council, R.D.C. Offices, Stockwell Road.

London.—ISLINGTON.—January 11th. Borough Council. Electrical and engineers' stores for twelve months. (December 2nd.)

BETHNAL GREEN.—January 20th. Electricity Department. Extra-high-voltage switchgear for one of the council's sub-stations. (See this issue.)

H.M. OFFICE OF WORKS.—January 6th. Installation of low-voltage, telephone and fire alarm cables at Bridgend, Brackla Hill R.O.F. (See this issue.)

Manchester.—December 30th. Electricity Department. Fire-extinguishing equipment for switch houses, transformer chambers, cable passages, &c., at Dickinson "B" sub-station. (December 9th.)

Mangotsfield.—December 20th. U.D.C. Electrical wiring installations in ninety-seven houses. F. Wallace, clerk, Council Offices, Staple Hill, Bristol. (Deposit £1 1s.)

Morley.—January 9th. Electricity Department. Cables, meters, joint boxes, service cut-outs, transformers, cookers, kettles, radiators, wash boilers, water heaters, immersion heaters, lamps and street lighting equipment for twelve months. (See this issue.)

Newcastle-on-Tyne.—January 21st. Transport and Electricity Committee. High-voltage, lead-cased, p.i. cable. (See this issue.)

Newport.—Electrical work for new police station and law courts at the Civic Centre. Albion T. Snell & Partners, Suffolk House, Laurence Pountney Hill, Cannon Street, E.C.4.

Electricity Department. 10,000 electric lamps. A. Nichols Moore, electrical engineer, Electric House, Dock Street.

New Zealand.—WELLINGTON.—January 31st. Posts and Telegraph Department. 620-ft. of 11-kV single-core cable and six cable-end sealing boxes. (T.Y. 29244/38.)*

February 3rd. Twelve 230/25-V step-down transformers. (T. 30045/38.)*

February 1st. 300 miles of cable. (T. 29810/38.)*

February 21st. Cable, and cable-end sealing boxes. (T. 29241/38.)*

January 25th. 500, 250 and 400 junction blocks with covers. (T. 29237/1938.)*

January 26th. Twenty-four battery testing sets. (T. 29380/38.)*

January 31st. Public Works Department. Quantities of 400-V cable. (T. 30048/38.)*

DUNEDIN.—January 9th. Electric Power and Light Department. Five 6,600-V circuit-breakers. (T.Y. 29232/38.)*

Oldham.—December 20th. Electricity Committee. Cast-iron frames and covers and earthenware conduit for twelve months. (December 2nd.)

Portsmouth.—Electricity Undertaking. One 30,000-kV turbo-alternator and two water-tube boilers. (December 9th.)

Repton.—December 16th. R.D.C. Automatic electrically operated pumping plant for the new sewage pumping station at Bretby. Consulting engineers, Wilcox, Raikes and Marshall, 33, Great Charles Street, Birmingham (deposit £2 2s.).

Royton.—January 9th. U.D.C. Installation of street lighting: Oldham and Rochdale Roads (sodium) and Higginshaw Lane and Heyside (mercury). (See this issue.)

Rutherglen.—December 20th. Town Council. Electrical work at sixty tenement houses. Hugh Inglis, burgh engineer and architect, Town Hall Buildings.

Seaham.—U.D.C. Twenty-two discharge lighting lanterns and control equipment and forty-seven directional street-lighting fittings. Plans by J. S. Forster, electrical engineer.

Sheffield.—January 12th. Electricity Department, Pipework, tanks, valves, &c., in connection with a 50,000-kW turbo-alternator. (See this issue.)

Skipton.—January 2nd. Electricity Department. One 11-kV and one low-voltage six-panel switchboard, and two 400-kVA indoor type transformers. (December 9th.)

South Africa.—PRETORIA.—January 12th. Union Tender and Supplies Board. Radio receivers. (T. 29591/38.)*

January 19th. Inter-office telephone communication system. (T. 30013/38.)*

CAPE TOWN.—December 24th. Electricity Supply Commission. 500 30 ft. and 150 27 ft. steel electric lighting poles. (T. 29338/38.)*

JOHANNESBURG.—December 24th. City Council. 2,000 and 100 electric meters and 100 time switches. (T. 29726/38.)*

December 28th. City Council. One electric lift. (T. 30000/38.)*

Stockport.—December 24th. Electricity Department. Vertical and horizontal, built-up, skeleton-type sub-station switchgear for twelve months. (December 2nd.)

Wareham.—December 21st. Town Council. Two sets of vertical spindle centrifugal pumps and electric motors with automatic control, including all necessary accessories and incidental works, at the Northgate sewage pumping station. Lemon & Blizard, Castle Lane, Southampton (deposit £3 3s.).

Orders Placed

Barrow.—Electricity Committee. Accepted. Laying cable to Millom (£5,747).—Siemens Bros. Overhead lines to High Newton and Field Broughton (£4,196).—Johnson & Phillips. Switchboard for Askam sub-station (£1,810) and switchboard for Millom sub-station (£1,043).—Ferguson, Pailin.

Brighton.—Corporation. Accepted. Transformers for Longridge Avenue sub-station.—C. A. Parsons. Switchgear for Beechwood Avenue and Cheapside sub-stations.—Switchgear & Cowans. Electrical installation at the Museum and Art Galleries (£383).—W. H. Fellingham & Sons.

Carlisle.—Electricity Committee. Accepted: 300-W and 500-W lamps.—Insular Electric Lamp Works. Other lamps.—Luxram Electric.

Cheshire.—County Council. Accepted. Electrical installation and lifts at the County General Hospital extensions, Clatterbridge (£6,841).—B. French.

Colchester.—Electricity Committee. Accepted. Electrical installation at North Street council school (£502).—Central Electrical Co. (Colchester), Ltd.

Dearne Valley.—Water Board. Accepted. Two electrically driven centrifugal pump units with all attendant pipework, switchgear, &c., at Dearne Valley Colliery.—Harland Engineering Co.

East Ham.—General Purposes Committee. Accepted. Amplifying apparatus at Town Hall (£195).—Advance Sound Apparatus Co.

Electricity Committee. Recommended. Cable contract extension for five months.—Liverpool Electric Cable Co.; Enfield Cable Works.

Glasgow.—Education Committee. Accepted. Electrical work at Househillwood temporary school extension (£523).—Kennedy, Stark & Co.

Horsham.—West Sussex County Council. Accepted. Rewiring at the Institution (£637).—H. Saunders & Sons.

Leeds.—Health Committee. Accepted. Electric mincing machines (£161 and £31).—Peerless Electrical Manufacturing Co., Ltd.

Cleansing Committee. Accepted. Electric lighting installation at Brokett Street and Armley Road depots (£213).—R. F. Winder.

Llandudno.—U.D.C. Accepted. Rewiring electrical installation at the hospital (£108).—H. C. Jones.

Portsmouth.—Contracts Committee. Accepted. Voltage regulator (£326) and three 500-kVA transformers (£544 each).—Ferranti, Ltd.

Sheffield.—Cleansing Committee. Accepted. Eagle Compressimore electric refuse collector (£1,500).—Electricars.

South Shields.—Town Council. Accepted. Electrical accessories.—Ioco Rubber Co.; B.T.H. Co.; East London Rubber Co.; Lighting, Heating and Traction Supplies; British Electrical and Manufacturing Co.; B.I. Cables; Adamson & Co.; G.E.C.; Durham Cables; Siemens Electric Lamps & Supplies Co.; Henley's.

Education Committee. Accepted. Electrical installation at Holy Trinity school (£83).—C. Ramsey & Son.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses (880), Middlefield and Garthdee; burgh surveyor. Ice rink, Anderson Drive South and Ruthrieston Road; Aberdeen Ice Rinks, Ltd.

Abergavenny.—Cattle market and buildings, &c.; W. Hopwood, town clerk.

Barnard Castle (Co. DURHAM).—Garages, Cecil Road; F. Deacon.

Barrow-in-Furness.—Houses (52), Jesmond Avenue; A. Peet.

Bedlington.—Houses (70), Church Lane, for the U.D.C.; G. Towers, builder, Union Street, Blyth.

Berwick.—Houses (13), Walkergate; borough engineer.

Billingham-on-Tees.—Houses (163), Monkseaton estate; H. E. Dawson (Estates), Ltd., Monkseaton Drive.

Birkenhead.—Mill, Dock Side, Beaufort Road, for Spillers, Ltd., Cunard Building, Pier Head, Liverpool; Willink & Dod, architects, Cunard Buildings, Pier Head, Liverpool.

Birmingham.—Factory, Highgate Street, for A. Swingler; G. R. Arden (Builders), Ltd., Stratford Road, Sparkhill, Birmingham. Factory, Millpool Hill estate, for G. Newey & Co., 37, Hockley Hill.

Brandon (Co. DURHAM).—Houses (156), for the U.D.C.; J. Thorne, builder, Willington.

Canterbury.—Market scheme (£29,700); H. M. Enderby; city surveyor.

Castle Ward.—Houses (40), for R.D.C.; J. Jameson, surveyor, Ponteland.

Cheltenham.—Houses (40), Bafford Farm, Charlton Kings; L. W. Barnard & Partners. Offices and flats, Ravenscote, London Road; United States Debenture Corporation.

Cheshire.—School, Audlam, near Nantwich; F. Anstead Browne, county architect, The Castle, Chester.

Chesterfield.—Houses, near Perryville Road; Frank Haslam, Ltd., Hall Cross, Doncaster. Extensions to Royal Infirmary (£32,000), for the governors; M. A. Boone, secretary.

Coventry.—Art Gallery and museum, St. Mary Street, for T.C.; A. Herbert, architect, 18, Friar Lane, Leicester.

Darfield.—Houses (43), for U.D.C.; Dyson, Cawthorne & Coles, architects, Regent Street, Barnsley.

Darlington.—An air-raid centre (£6,000); E. Minors, borough engineer, Town Hall.

Daventry.—Houses, Long Buckby and Braunston; R.D.C. surveyor.

Derby.—Hotel, Full Street, for Pountain & Co., Ltd., Market Place; Browning & Hayes, architects, Irongate, Derby.

Dudley.—Houses (32). Pitfield Row; F. H. Gibbons, surveyor.

Dundee.—Cinema, Arbroath Road; J. B. Milne, cinema proprietor.

Elstree.—Houses (150), Edgwarebury estate; W. F. Thorpe, architect, 26, Broadway Mill Hill.

Gateshead.—Hospital, Sheriff Hill (£300,000); borough surveyor.

Harrogate.—Winter gardens, concert hall, &c., borough surveyor.

Helmsley (YORKSHIRE).—Houses (28), for the Helmsley R.D.C.; R. P. Brotton & Son, architects, Chopgate, Middlesbrough.

Keighley.—Bus station, Lawkholme Crescent, Bow Street and Queen Street, for the Corporation and West Yorkshire Road Car Co., Ltd.; S. Needham & Son, architects, 3, Dunscombe Place, York.

Kettering.—Houses (100), Avondale estate, for the T.C.; J. P. Haugh, borough surveyor.

Kingston-on-Thames.—Extensions to Kingston County Hospital (£600,000); county architect, Kingston-on-Thames.

Leeds.—Dwellings (875), Seacroft estate; city architect. Ten shops and flats, Cross Gates Road; Regal Cinema (Cross Gates), Ltd.

Liverpool.—Factory, Edwards Lane, Speke, for the Hayes Engineering Co. (Speke), Ltd. Printing house, Edge Lane, for H. Littlewood, Ltd., Old Swan; William Thornton & Sons, Ltd., builders, 38, Wellington Road, Liverpool, 8. Extension to Garston depot (£60,000), and bus garage, Green Lane (£45,000); borough surveyor.

London.—(CAMDEN TOWN).—Extensions to factory, Hampstead Road, for Carreras, Ltd.; Sir R. McAlpine & Sons, Ltd., contractors, Pall Mall, S.W.1. (MILE END).—Nurses' home hospital (£37,284); Truett & Steel, Ltd. (SOUTHWARK).—Baths, Borough High Street; Snell & Partners Electric, engineers. (S.W.1).—Extensions to United University Club, Pall Mall (£50,000); Sir R. Blomfield & Son, architects, New Court, Temple, E.C.4. Extensions to Polytechnic (£27,965); governors.

Luton.—Extensions to Spittlesea Hospital (£28,800); borough surveyor.

Maidenhead.—Extensions to factory, for St. Martin Preserving Co., Cordwallis estate.

Manchester.—Garage and offices, Ashton New Road; Robert Carlyle & Co., builders, Old Trafford.

Margate.—Houses (58), Crow Hill estate; borough engineer.

Market Harborough.—Extensions to factory, Factory Lane; Symington & Co., Ltd.

Millom.—Conversion of Market Hall into Council offices (£9,000); R.D.C. surveyor.

Motherwell.—Houses (284), for the Scottish Special Areas Housing Association, 73, Shandwick Place, Edinburgh; the secretary.

Netherburn (LANARKSHIRE).—Houses, for County Council; architect, County Council Offices, Hamilton.

Newmilns.—Cinema, Main Street, for Mrs. Young, Bishopbriggs, Glasgow; J. & J. Hendrie & Jamieson, Galston.

Northern Ireland.—(BELFAST).—Offices (£50,000), for Water Commissioners; Silcock & Thearle, architects, 66, Rodney Street, Liverpool.

Nottinghamshire.—Alterations and extensions to the Brunt school, Mansfield (£30,000), for the County E.C.

Oldbury.—Houses (14), Tinkers Farm estate; S. H. Rowe. Bank, Dog Kennel Lane; Barclays Bank, Ltd.

Pershore.—Houses (21), on five sites, for R.D.C.; F. J. Nicholas, clerk, Council Offices, High Street.

Portsmouth.—Houses (126), Hawthorn Crescent; C. & W. Mitchell. Nurses' home, St. Mary's Hospital (£7,292); borough engineer.

Prestatyn.—Holiday centre (£500,000), for The British Holiday Estates, Ltd., St. Pancras Chambers, Euston Road, London, N.W.1; W. H. Hamlyn, architect.

Prestwick (AYRSHIRE).—Houses (160), for T.C.; burgh surveyor.

Rothbury.—Houses; R.D.C. surveyor.

Rotherham.—Houses (22), Droppingwell Road; A. Watson, Droppingwell Road. Factory, Fitzwilliam Road; Van Den Bergh Carpet Co., Ltd.

Rothwell (YORKSHIRE).—Houses (21), Greenmoor Avenue; H. Bennett, Lofthouse.

Rowley Regis.—Houses (30), Springfield Lane; Roberts Bros., builders, 51, Crompton Road, Cradley Heath.

Scarborough.—Houses (18), Edge Dell; A. Webster. Reconstruction of Olympia; borough engineer.

Seaton (CUMBERLAND).—Houses (24), for North-Eastern Housing Association; T. Nicholson, architect, 37, Washington Street, Workington.

Sheffield.—Houses (32), Handsworth Nurseries estate; E. Cooper. Houses (16), Rowan Tree Hill; R. E. Sheard. Houses and garages, Strutt Road, Shirecliffe Lane, Cooks' Wood Road and Rutland Road; C. W. Alflat, 32, Kingfield Road, Sheffield, 11. Extensions to works, for Ernest H. Hill, Ltd., Fitzwilliam Street.

Smethwick.—Cinema, Abbey Road, Warley, for T. D. Hogg, Northfield, Birmingham; H. Robinson, architect, 6, Cherry Street, Birmingham.

South Shields.—School, Wenlock Road; G. R. Smith & Partners, architects. Extensions to Town Hall, for T.C.; borough engineer. Extensions to works for J. Robson (Boatbuilders), Ltd.; F. W. Newby, architect, 10, King Street.

Stafford.—Houses (125), Silkmore estate, for T.C.; W. Plant, borough engineer, Borough Hall.

Stockton-on-Tees.—Civic centre (£100,000), and houses; borough engineer.

Stourport-on-Severn.—Branch bank, High Street, for the Martins Bank, Ltd., 7, Water Street, Liverpool; E. C. Aldridge, architect, 14, Castle Street, Liverpool.

Sunderland.—Houses (12), Veryan Gardens; G. T. Brown and Son, architects, 51, Fawcett Street. Mineral water factory, Roper Street, for the North-Eastern Trading Estates, Ltd.; W. and T. R. Milburn, architects, 17, Fawcett Street.

Surrey.—Schools, Dorking, Bristow Farm estate, Frimley, and Send (£15,250), for the County E.C.

Tadcaster.—Houses (30), Barwick-in-Elmet, for R.D.C.; J. Worthington, engineer and surveyor.

Tredegar.—Houses (50), Nantybwch; E. L. Rosser, builders, Cardiff.

Wakefield.—Depot and showrooms, Barnsley Road; South Yorkshire Motors, Ltd.

Wallsend-on-Tyne.—Houses (137), near the Holy Cross Cemetery; R. A. Gofton and Sons, builders, Pykerley Road, Monkseaton. Houses in flats, near Archer Street; J. H. James, builder, High Street East. Steel-framed building for the North-Eastern Electric Supply Co., Ltd.; L. G. Couves and Partners, architects, Carliol House, Newcastle-on-Tyne.

Watford.—Extensions to factory, By Pass Road; Watford Foundry Co.

Witney.—Houses (50), Burford estate; U.D.C. surveyor.

Wolverhampton.—Houses, Pond Lane and Navigation Street, for T.C.; borough engineer, Town Hall.

Workington.—Houses (24), Frances Croft; borough engineer. Extensions to buildings for the Catholic Authorities; T. Milnes-Foden & Partners, Century Buildings, 199, Deansgate, Manchester.

Wortley.—Council offices (£13,976); R.D.C. surveyor.

Yorkshire.—School, Clifton Without, near York, for the North Riding E.C.; F. Barraclough, secretary, Education Offices, Northallerton. School, Cusworth Lane, Adwick-le-Street, for the West Riding E.C.; T. H. Johnson & Son, architects, Priory Place, Doncaster.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

DUTCH brand rubber tape.
DEXTER washing machine.
WINCHESTER wind pump and dynamo.